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No. 1.

### STEAMER LEWIS LUCKENBACH

In a recent number the *Marine Review* gave a brief description of the steamer Lewis Luckenbach, built for Lewis Luckenbach of New York by John H. Dialogue & Son, Camden, N. J. It is now enabled to present drawings of the midship and longitudinal sections of the vessel and therefore repeats in a measure its former description. The Luckenbach, which was built for the general coasting trade is a much more shapely ship than the ordinary type of cargo carrier, and is designed especially for carrying heavy loads on light draught. She is 362 ft. over all, 48 ft. beam and 28 ft. deep. She is built under classification and special survey of Lloyds Register

of British and Foreign Shipping to their highest class for sea-going service. She is designed under the three-deck rule, having two complete steel decks and steel bridge deck with beam on each frame and deep framing. There is the usual top-gallant forecastle, full poop and long bridge house.

She has double bottom on the cellular system running clear fore and aft and the forward end of the vessel is especially stiffened for pounding in heavy seas and for ice. There are four main cargo holds besides the space in the poop and in the 'tween decks alongside of machinery and bridge house. The hatches are 16 ft. by 24 ft. with high coamings and with braces at side. There are eight hoisting engines with separate derrick for each for rapid handling of cargo. The masts are of steel.

The engines are of the triple-expansion type, having cylinders 26 in., 42 in. and 68 in. in diameter for a working pressure of 180 lbs. The engines are specially constructed so as to be easily accessible for repairs, having open fronts, pumps and condenser independent of the main engine. The crank shaft is in three sections of interchangeable type, the high and intermediate pressure having piston valves and the low pressure double ported slide.

The circulating pump is independent of the centrifugal type. The feed pump is independent of vertical duplex type.

Double ballast pumps have been fitted so that either or both can be used to pump out the tanks. Feed water heater, filter and evaporator have also been supplied. The thrust bearing is very large of horse-shoe type.

The Luckenbach has three main boilers of the Scotch type 14 ft. 2 in. diameter, 10 ft. 8 in. long, having three corrugated furnaces, and each furnace having a separate connection. The

working pressure is 180 lbs. The donkey boiler is vertical, cross flue type, located in 'tween decks suitable for a working pressure of 120 lbs.

The steamer is equipped with a direct driven steam windlass of Hyde pattern for 2 1-16 in. chain. Her steam steering gear is of the William-son type. Differ-

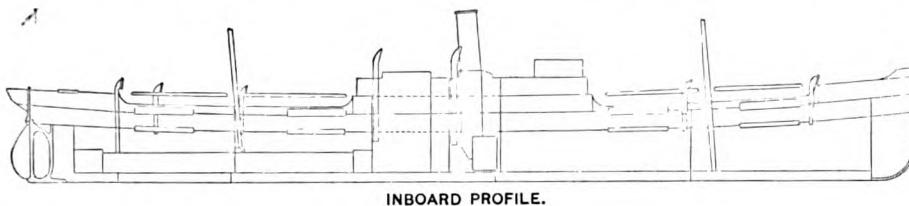
ential hand screw steering gear is fitted on top of poop with quadrant and steering relieving gear.

Special care has been taken in designing the deck house to provide commodious accommodations for officers and crew. The accommodations for sailors and firemen is in the top-gallant forecastle.

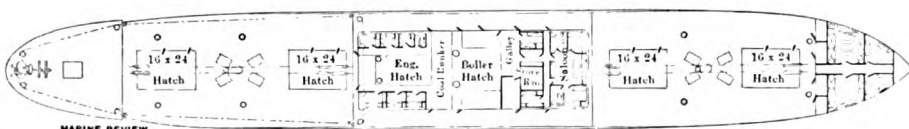
### 500-TON STEAMER IN THE ANDES

The steamer Orange Branch sailed from Hull recently for Mollendo, South America, with the entire hull, machinery and outfit of the s. s. Inca (built by Earle's Shipbuilding & Engineering Co., Ltd., Hull), which is intended for service on Lake Titicaca, Peru, and her sailing marks an important stage in what has been, and will continue for some time to be, a very interesting piece of work. There is nothing new in the construction and shipment of small vessels in pieces for re-erection in foreign parts, but not often has work of this description been carried out on such a large scale and completeness in all details as in the case of the Inca. The fact that the whole of the work has had to be erected and then taken to pieces has necessarily involved special precautions being adopted to insure the shape of the structure being maintained up to the point of taking down.

In due time the Inca will no doubt be registered as be-



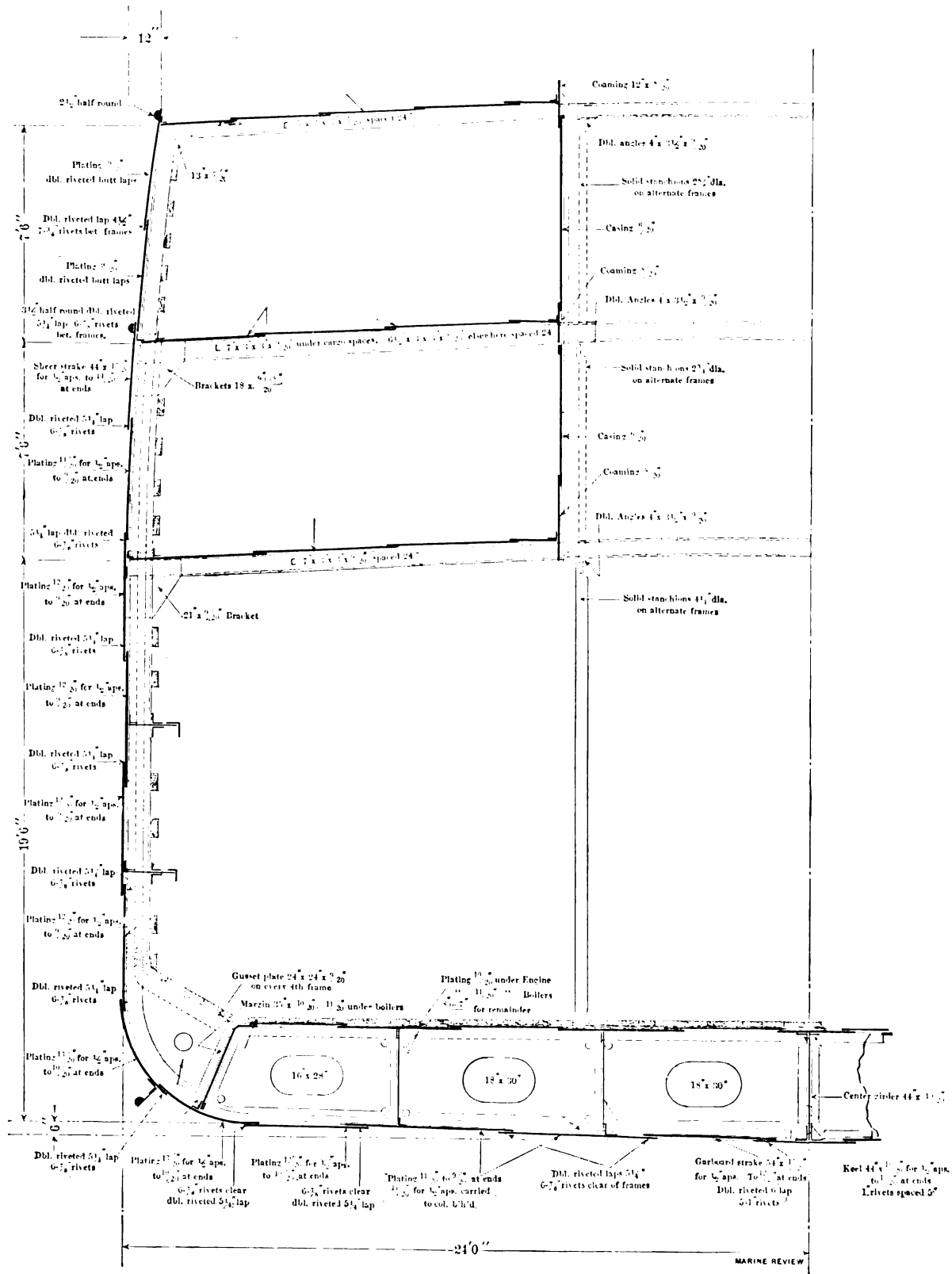
INBOARD PROFILE.



PLAN AND ARRANGEMENT OF HOUSE AND FORECASTLE.

longing to the port of Puno, on Lake Titicaca, Peru. This lake is situated high amongst the mountains of that country. There are three steamers at present running on Lake Titicaca, all of them, however, much less in size and power than the Inca. The first steamer was placed on the lake before the

arrangements and facilities for working cargo, and is fitted with good accommodation for twenty-four passengers. Her dimensions are 220 ft. by 30 ft. by 14 ft. and she is propelled by twin-screw engines of 1,000 H. P. and will have a speed of 12 knots.



MIDSHIP SECTION OF THE STEAMER LEWIS LUCKENBACH.

present railway from the coast existed, and it is understood that every part of this vessel was carried up the mountains on the backs of mules to the site of erection.

The Inca will carry about 550 tons deadweight and has good

The saloons, state rooms, pantries, etc., were all built up in the joiners' shop, a portion of this building having been prepared to represent the deck of the vessel, and this section of the work was completed in practically all its details, in-

cluding upholstery, curtains, rods, dining tables, etc., as well as an installation of steam heating. The leads of wires for the electric light, position of switches and all other details were marked on the cabin sides. The auxiliary machinery, fans for forced draft, with pipes and connections, were all fitted up on the ship. The whole ship was then taken to pieces and packed in over 3,000 separate packages, each of which requires a separate mark of identification for those who will have to undertake the re-erection; there are also separate marks for shipment purposes.

The port of Mollendo, where the materials will be discharged, also presents points of interest. Although the goods have been shipped without difficulty by the aid of modern appliances in Hull, it will be very different at Mollendo. At this place, it is understood, the barges or lighters which convey the goods from the steamer in the open roadstead are subject to a heavy ground swell from the Pacific, which renders the unloading an operation of considerable risk to those engaged in the work.

From the port of Mollendo to the site of re-erection on Lake Titicaca, which is situated between the ranges of the Andes, the goods have to be conveyed by rail a distance of about 150 miles. The railway, which runs along the mountain sides and across valleys, is a remarkable work of engineering and rises in the 150 miles to an altitude of over 12,000 ft.

The site of erection is also interesting, and it is said represents the cradle of the old Inca races which ruled in Peru before the Spaniards, and to this day in the district where the steamer Inca will work and the adjacent country, remains of this ancient civilization are to be found in the shape of large aqueducts, terraces and other indications which show that the district was at one time under a system of garden cultivation. It is pleasing to state that notwithstanding the novelty of construction, which necessitated large portions of the ship being left in a very incomplete condition, owing to the absence of fastenings, and also to the risk of taking to pieces such an intricate structure, the whole of the work was carried out practically without accident to those engaged.

#### ADVANTAGES OF FLOATING DOCKS\*

This paper deals with the floating dock as a method of getting at the under water portion of ships, and the author points out that this appliance, although in common use, is less known in England than elsewhere, which he ascribes to the fact that the rise and fall of tides on the British coasts naturally favors the excavated form of dock, whereas in non-tidal waters, as he shows by statistics, the floating dock is equally as common as the other.

It is pointed out that the time required for constructing a floating dock is much less than that needed for the excavated dock, and instances are given of large docks having been completely designed and built in well under a year. The advantage of the mobility of the floating dock is then discussed, both from the point of view that this allows of its being built in the cheapest and most suitable yard and then towed to its destination, and also that in the case of alterations to its site, or development of the port where it is placed, it is not tied to such site or port, but may be bodily moved to any more suitable place. The advantage of mobility from a strategical point of view is also shown, and it is pointed out how such a dock would be useful in connection with any existing arsenals, which are naturally always placed at some distance from the sea, for it could be sent down the channel to pick up and patch "lame ducks" before they attempted the narrow passage leading to the arsenal. The author mentions that it has indeed been proposed that a floating dock should accompany a fleet into action, ready to pick up wounded vessels after an engagement, but in his opinion this is not yet a practical scheme,

\* From a paper read before the Institution of Civil Engineers on the 31st ult., by Lionel E. Clark, M.I.C.E.

the difficulties of propelling such a dock even at ordinary cruising speeds being insurmountable. At the same time, he strongly advocates the use by all naval powers of a floating dock towed by a vessel containing ordinary ship repairing tools, which could at any time be easily transferred to any base that the fleet may have seized, or could provide or supplement the docking accommodation in those home ports where the same did not exist or was of insufficient capacity. The drawback to the extensive use of such a dock would naturally be the depth of water required at its moorings, but it is pointed out that the maximum amount of excavation required for the berth of a floating dock would never be more than that required for the excavated dock, with the advantage that whereas in the latter case the excavation would have to be made entirely in the dry, in the former it would merely be the removal of material by ordinary dredgers. On the other hand the floating dock possesses many advantages in the choice of site, since it can be placed end-on with the stream, thus facilitating the entrance of vessels; and it does not require its entrance to be placed, like that of most graving docks, more or less at right angles to the stream. Again, in rivers which are subject to a strong freshet, the floating dock is equally available either at high or low water, whereas a stone graving dock would either have to be built very much deeper than required or else would be submerged in times of flood. In connection with this the author discusses the point whether a vessel on a floating dock is not much better placed for purposes of repairing or painting than in the bottom of an excavated dock, and points out how open to light and air are vessels on the former. He also claims that this openness of the floating dock has other advantages in that it allows them to deal with vessels of much greater length than the dock itself, and instances of this facility are adduced; whilst the one-sided docks have an equal advantage as regards beam of vessels lifted. It is admitted that floating docks have their limitations, represented by the amount of their lifting power, but at the same time it is argued that though they may not be able to lift a vessel entirely, they can frequently lift it enough to enable the required repairs to be effected.

The first cost of floating docks is dealt with, and in order that an idea of their cost may be obtained, a list of the actual hull weights of several docks of different types are given.

The cost of working is also dealt with, and it is pointed out that the floating dock has a great advantage in respect of the cost of coal and oil, as the power required to lift a ship is much less than that required for a graving dock of similar capacity. Instances are given where it costs, on the average, less than 18s to lift vessels displacing 3,000 tons.

The cost of maintenance of a floating dock is gone into in some detail, and in the appendix many instances of the actual amounts expended on repair and upkeep are given, based on the results of a number of years; from these it is found that the average cost is a little more than 1 per cent per annum of the first cost of the dock.

Some further statistics are given as to the useful life of a floating dock, and iron docks which have now been at work for over forty years are mentioned; from which the author concludes that the useful life of a floating dock may be fairly taken as at least fifty years. He points out that a life of this duration requires only a sinking fund equal to 1 per cent per annum on the first cost of the dock invested at 2½ per cent.

The Red Star Towing & Transportation Co. has been organized under the laws of West Virginia with \$100,000 capital stock to take over the business of the Red Star Towing & Transportation Line, which concern has been in existence for some years. The officers are Wm. E. Barber, president; Walter L. Smith, vice president and treasurer; Francis F. Reeve, secretary. The offices of the company are 116 Broad street, New York.

## APPARATUS FOR FUELING STEAMERS

Every new device for fueling steamers is interesting because the general subject is in itself a problem. Fuel is the life of

the steamer. It must be put aboard economically, quickly and, if possible, in such a manner as not to interfere with the loading of vessels. On the great lakes the coarse freighters are usually supplied with fuel at the same time that they receive their cargoes — the cars are merely dumped into the fuel hold. Those that cannot come to dock are supplied with fuel from lighters. In such harbors as New York however which are congested with traffic and which deal with a multiplicity of freight products the problem presents different phases. The barge with its fueling apparatus is cumbersome and is more or less in the way. There is therefore real need for a high speed coaling apparatus. Mr. L. A. De Mayo, who has been a stevedore on



SHOWING THE METHOD OF SUSPENDING THE MACHINES FROM THE VESSEL.



FEEDING THE COAL INTO THE BUCKETS.

the American Line docks for twenty years past has recently evolved an apparatus which has proved so practical that the American Line has adopted it in its North river piers and other

lines are negotiating for it. The machine, as will be seen from the illustrations for which the Review is indebted both to Mr. De Mayo and the Scientific American, consists of a comparatively light, steel frame tower. Within this is an endless articulated steel belt carrying buckets made of the same material. The belt runs over sprockets at each end of the frame. Near the upper end of the tower between the rising and de-

scending chains of buckets is an electric motor which drives a large spur wheel. The upper belt sprocket is driven from the shaft of the large spur wheel by means of a chain. The supply current for the motor is taken from the dynamos on board the ship, and its speed is regulated by a portable automatic-release starting box. The weight of the entire machine of the type in use at present is about two tons; its dimensions are approximately 31 x 3 x 3½ ft. It has twenty-nine buckets, each of which is designed to hold a cubic foot or about fifty-six pounds of coal. A crew of six men is required per machine. The apparatus can be suspended by means of ordinary tackle from either side of a ship, or from the pier. Its weight keeps its lower end below the level of the surrounding coal pile, gradually lowering as this is decreased. It can readily be moved in the barge or on the pier by four men. The narrow harbor barges with open loads, carrying about 400 tons of coal, are very well adapted for the use of the apparatus, and thus all available dock space is left free for the handling of cargo.

When run at its highest rate of speed, the apparatus can deliver a hundred and eighty tons of coal per hour. At this rate, however, there is great difficulty in economically feeding the coal, and the usual rate of delivery is about a hundred tons per hour. This rate includes a generous allowance for time lost in moving the machines from bunker port to bunker port, and shifting from one barge to another. As a rule, three or four of the machines are used on each side of the ship. In case of necessity eight machines on each side could be placed, and in this case a vessel of the size of the St. Louis or St. Paul could easily be coaled in ten hours. In the old manner of coaling with steam-hoist buckets, seven men could handle fifteen tons of coal per hour. The advantage of the new system over the old is too apparent to need comment.

With the old system just mentioned, large quantities of coal were lost, falling overboard either when the buckets were hoisted, or while they were being emptied. In the De Mayo apparatus, the coal travels from the barge to the bunker entirely within inclosed passages, for though the illustrations



show the machines as partially open, they are ordinarily enveloped in tight canvas jackets, only the lower extremity, where the coal is shoveled into the buckets, remaining uncovered. A further great advantage arising from this is the almost perfect elimination of the coal dust. The officers in



THE MACHINES ON THE BARGE.

charge of vessels that have used this apparatus are very enthusiastic over this advantage of the De Mayo system, for the clouds of coal dust incident to the period of taking in coal in the old way sadly interfered with the spick-and-span appearance of the ship.

#### SAFEGUARDING COMMERCE OF SAN FRANCISCO

The government seems fully alive to the importance of affording every necessary safeguard to the commerce of San Francisco, in the way of protection to vessels entering and departing from the Golden Gate. This action has been taken mainly on the recommendation of the congressional delegation from California, backed by representations of the shippers, merchant marine and vessel owners of San Francisco.

In these matters, the Lighthouse Board have greatly aided in the governmental action by its recommendations. Very recently two additional lightships arrived at San Francisco from New York assigned for duty in this district. This increases the number to four. One of the new lightships will be permanently stationed off the entrance to San Francisco harbor, while the other will be used as an extra, or substitute vessel, whenever occasion requires. The addition of these two vessels will be of much importance to the general safety of commerce of the port.

A new light station is also to be established soon on the eastern shore of the main bay nearly opposite Point Richmond. For this much needed beacon, an ample appropriation has been made, and work will soon begin. By far the most necessary and important work is the beaconing of "Mile Rock," for which congress has made the very liberal appropriation of \$100,000. For the past half century, this rock has been a constant menace to every vessel entering and departing from

Golden Gate. Why this dangerous rock was not either blown up, or properly beaconed, is a wonder; but it has been permitted to remain, guarded only by a large bell buoy stationed near.

Mile Rock is located one mile (inward) from a line drawn from the light station on North Heads across the channel's entrance to the Cliff House, and three-eighths of a mile from the mainland on the East.

It was nothing but a sharp, ragged point of rock jutting only a few yards above the sea level at low tide. During rough weather Mile Rock is constantly swept by waves. It is exposed to the full force and fury of all winds and seas.

To properly beacon this rock has proved a most difficult and dangerous piece of work. The rock was first leveled off or "surfaced;" then a huge steel cylinder 40 ft. by 25 ft., and 42 ft. above mean sea level, was constructed. This cylinder, constructed slowly and by piecemeal, was fitted down firmly over the shoulders of the rock—like a colossal stove pipe—and filled with concrete. This foundation has just been completed. From the top a steel superstructure 50 ft. high is now being built. The light (a third order) will be 94 ft. above sea level. So strongly has the foundation been constructed, that the force and fury of winds and waves cannot move it.

Within less than three months it is expected that the light—which will prove so friendly and assuring to storm-tossed navigators—will be displayed for the first time.

#### WILL MEAN MUCH TO SHIPPERS

A San Francisco correspondent writing under a recent date, has this to say regarding the effect on shipping of the end of the Russo-Japan war:

"The establishment of peace between Russia and Japan will present a rather intricate problem to the shipping men of San Francisco. Every prominent shipper in the city firmly believes that as soon as the present hostilities have been brought to a close, and the trend of the Orient will turn toward the furtherment of commerce, that the export trade will increase fully 100 percent. American shippers realize the fact that they have to contend with the handicap brought about through the lack of a ship subsidy for vessels flying the American flag. Following this comes the question of the attitude of the Japanese shipping companies and the stand they will probably take when it comes to a question of securing the contracts for outward bound freights. It is recognized by every shipper in this section of the country that the Nippon Yusen Kaisha Co. hold the supremacy of the merchant marine service on the Pacific Ocean. Should that company desire to monopolize the trade, it could throw a fleet of vessels on the trans-Pacific route which would render all competition on the part of the American firms practically useless.

It is conceded, according to the consensus of opinion of the different steamship men, that the companies now engaged in transporting freight across the Pacific have all they can do at the present time. This signifies that if they would contend with outside companies in an attempt to secure trade, they would have to charter ships from some other company. The steamship men also contend that sailing vessels will figure rather prominently in the freight traffic. They state that should this eventually occur, it would mean a disastrous blow to American shipowners. If the sailing vessel proves to be a factor in the trade, foreign vessels, not American, will reap the golden harvest, according to the opinion of men well versed in shipping.

Foreign vessels, by reason of the subsidies given them by their respective governments, are enabled to underbid the American by fully 30 percent. An example of this was afforded by the recent contracts for the transportation of lumber for the construction of the Panama canal which the foreign vessels secured owing to the fact that they were able to underbid the American.



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After a deliberate and thorough inquiry in this country and abroad, the Isthmian Canal Commission has finally purchased not-foreign-built but American-built steamers for its important mail, freight and passenger service to the canal zone on the Atlantic side, from New York down through the West Indies to Colon.

This act of the commission is of the most cheering significance to the ship owning and ship building interests of the United States. The issue has been drawn fairly and squarely and the commission has declared unequivocally in favor of the American ship. Powerful interests were known to be at work to prevent this. The great and rich foreign steamship corporations which now dominate most of the ocean carrying of the country regarded this question of ships for the canal as a test case—as determining whether there was likely to be any positive legislation by the next congress along the lines recommended by the Gallinger commission for the immediate upbuilding of the American marine. The premature exultation of these foreign companies a few weeks ago over a report, which

proved unfounded, that the requisite vessels were to be bought in England, now turns to bitter discomfiture.

On the other hand the action of the government deserves a prompt and cordial recognition from American shipping and commercial interests. It is an unmistakable token of friendliness to the nation's merchant marine. The government has frankly demonstrated its preference for American ships, and although there has been need of steamers for immediate service Chairman Shonts and his fellow-commissioners have patiently waited until they could make a full examination of the prices and equipment of available tonnage in this country and abroad. It is with this complete knowledge before them that the commissioners have decided that the best ships for their purposes, cost and all considered, were the splendid American-built Havana and Mexico, of the New York & Cuba Mail Steamship Company's fleet.

These steamers were constructed in 1899 at the celebrated Cramp yard on the Delaware. They were designed and built under the provisions of the Postal Aid Act of 1891, which requires inspection and approval by the navy department, and they are enrolled as auxiliary cruisers of the United States in time of war. They are steel twin screw steamers of the highest class—360 feet long, 50 feet wide and 32 feet deep, with a gross tonnage of 5,667. Triple expansion engines of 5,000 I. H. P. gave the Havana and Mexico a maximum speed of 17 knots, as tested on their official trials under the supervision of the navy department. Each ship will carry upwards of a hundred first-class passengers in well ventilated staterooms in steel houses above deck. The cargo capacity of the Havana and Mexico is relatively large, and they have exceptional facilities for handling freight with despatch and cheapness.

Foreign steamers of the same tonnage could probably have been purchased at a lower price, but, on the other hand they were not equal in speed and general character to the Havana and Mexico, which were especially constructed for tropical trade and embody the results of many years' experience in that service. Both ships have always been maintained in the very best condition, and indeed have been constantly and intelligently improved. The original cost of these steamers and the cost of the new facilities with which they have been equipped are many thousand dollars more than the \$650,000 paid for each vessel by the government.

Most welcome of all to the friends of American shipping, the New York & Cuba Mail Steamship Co. will place orders in American ship yards for two new steamers to replace the Havana and Mexico. The company already has two large steamers under construction by the Cramps, and it will possess when all four are completed, even more conspicuously than now, the largest deep sea steam fleet under American colors.

There is food for sober reflection in the fact that the Havana and Mexico and perhaps one other ship of the same company, were the only steamers in the registered fleet of the United States that in size, speed and other qualities completely met the requirements of the Isthmian Canal Commission. Here is a sharp reminder of the poverty of our maritime resources. The increase of our ocean fleet cannot be begun a day too soon.

If the Isthmian Canal Commission had purchased two foreign ships, no new vessels as substitutes for them would have been built in the United States. Because of the patriotic and enlightened action of Chairman Shonts and his associates, American labor gains the construction of two new vessels which will cost in the neighborhood of three-quarters of a million each, and the United States government gains the services of two new and valuable auxiliary cruisers. The right thing has been done and the men responsible for it deserve most heartily to be congratulated.

### FREIGHT MOVEMENT

The total ore movement for June was 4,000,450 tons or lacking exactly 550 tons to reach the 5,000,000 mark. This is the heaviest movement for a single month in the history of the ore trade. A movement almost equivalent to this, however, will have to be maintained during the next four months if shipments are to be in excess of 30,000,000 tons for the entire season. Ore vessels are getting excellent dispatch and there will be no difficulty whatever in handling 30,000,000 tons or better if necessary. To July 1 the ore movement has been 10,814,054 tons. The double holiday of Sunday and Tuesday did not leave things in as bad shape as might have been supposed. Extra efforts were made both on Saturday and on Monday to get the vessels out of port and in the case of the Pittsburgh Steamship Co. twenty-one were unloaded on Monday at South Chicago and at Lake Erie ports. In fact on both holidays there was a constant procession of upbound vessels in the rivers. Quite a number of the upper lake docks were operated on the Fourth of July and consequently lake Erie docks may be expected to be busy during the latter part of the week.

### ORDERS FOR SHIPS

If anything were needed to prove the soundness of the trade of the great lakes, it would be the frequency of orders for ships. The American Ship Building Co. has now on its books orders for twelve steamers for 1906 delivery. Never before have orders been placed so far in advance. Nor is this all. Further orders are pending which will increase by a considerable extent the active tonnage on the lakes. It is practically impossible now for the ship yards of the great lakes to promise a ship for delivery at the opening of navigation next year.

Mr. Henry A. Hawgood, president of the Hawgood Transit Co. of Cleveland has placed an order with the American Ship Building Co. for a freighter to take the place of the steamer Etruria, recently sunk in collision with the Amasa Stone. The new steamer will be of the 10,000-ton class and is for 1906 delivery. She will be a duplicate of the Lyman C. Smith and will be 545 ft. over all, 525 ft. keel, 55 ft. beam and 21 ft. deep. She will have triple expansion engines with cylinders 23½, 38 and 63 in. diameters by 42 in. stroke, supplied with steam by two Scotch boilers 14½ ft. long and 11½ ft. wide.

### COMMERCE OF SAULT STE. MARIE CANAL

The June report of the commerce of the Sault Ste. Marie canal shows the traffic to have been the heaviest in the history of the canal. The total traffic was 6,057,491 tons. The commerce to July 1 of the present year has been 13,133,444 tons as against 3,589,124 tons for the corresponding period last year. Following is the summary:

#### MOVEMENT OF PRINCIPAL ITEMS OF FREIGHT TO AND FROM LAKE SUPERIOR.

Items.	To July 1, 1905	To July 1, 1904	To July 1, 1903
Coal, anthracite, net tons.....	294,337	219,941	307,863
Coal, bituminous, net tons.....	1,572,717	947,946	2,368,855
Iron ore, net tons.....	9,812,041	1,385,054	7,439,479
Wheat, bushels.....	10,906,000	11,389,673	21,062,944
Flour, barrels.....	1,199,014	559,545	2,212,766

#### REPORT OF FREIGHT AND PASSENGER TRAFFIC TO AND FROM LAKE SUPERIOR, FROM OPENING OF NAVIGATION TO JULY 1 OF EACH YEAR FOR THREE YEARS PAST.

EAST BOUND.			
Items	To July 1, 1905	To July 1, 1904	To July 1, 1903
Copper, net tons.....	35,679	12,081	32,564
Grain, other than wheat, bushels.....	9,160,115	6,093,306	7,680,959
Building stone, net tons.....	4,638	2,850	1,690
Flour, barrels.....	1,198,839	559,545	2,212,766
Iron ore, net tons.....	9,812,041	1,385,054	7,439,479
Iron, pig, net tons.....	20,657	4,380	1,130
Lumber, M. ft. B. M.....	279,492	198,567	293,917
Wheat, bushels.....	10,906,000	11,389,673	21,062,944
Silver ore, net tons.....		407	
Unclassified freight, net tons.....	25,865	13,111	25,853
Passengers, number.....	4,871	2,905	8,431

WEST BOUND.			
Coal, anthracite, net tons.....	294,337	219,941	307,863
Coal, bituminous, net tons.....	1,572,717	947,946	2,368,855
Flour, barrels.....	175		30
Grain, bushels.....	63	625	
Manufactured iron, net tons.....	38,598	29,382	42,812
Salt, barrels.....	169,729	84,931	145,287
Unclassified freight, net tons.....	207,385	112,378	161,708
Passengers, number.....	5,257	2,701	8,444

#### SUMMARY OF TOTAL FREIGHT MOVEMENT IN TONS.

	To July 1, 1905	To July 1, 1904	To July 1, 1903
East bound freight of all kinds, net tons.....	10,995,233	2,269,847	9,043,078
West bound freight of all kinds, net tons.....	2,138,211	1,319,277	2,901,856
<b>Total freight, net tons.....</b>	<b>13,133,444</b>	<b>3,589,124</b>	<b>11,944,934</b>

Total number of passages to July 1, 1905, was 6,808 and the registered tonnage, 11,372,244.

The South Haven Towing & Wrecking Co. has been organized to do a general wrecking business on the great lakes. The directors are George L. Craig, Toledo; S. J. Dunkley and C. W. Williams, South Haven; George Bardeen, Otsego; O. W. Norton and L. Stanton, Chicago.

A life boat of a novel design has been constructed by Robert Mayo, son of Capt. R. D. Mayo and has been given a demonstration at Milwaukee. The boat is more like a torpedo than a boat. When it is launched the port holes are closed and the boat cast adrift. The passengers remain in a perpendicular position regardless of the sea.

Mr. Charles L. Potter, government engineer with headquarters at Duluth, has just opened bids for dredging Portage Lake ship canals. The bidders were the Great Lakes Dredging & Dock Co., Chicago, \$20,435; Lake Superior Contracting & Dredging Co., Duluth, \$19,020; Zenith Dredge Co., Duluth, \$25,020; James Pryor, Houghton, Mich., \$17,850.

President Wm. Livingstone of the Lake Carriers' Association and Mr. Harvey D. Goulder, counsel, went to Washington last week to appear before the executive committee of the Board of Supervising Inspectors in regard to securing a modification of rules governing the carrying of all passengers aboard freight boats on the great lakes and also the requirements relating to the installation of fire fighting apparatus on freight ships. They expect the matter will be satisfactorily adjusted.

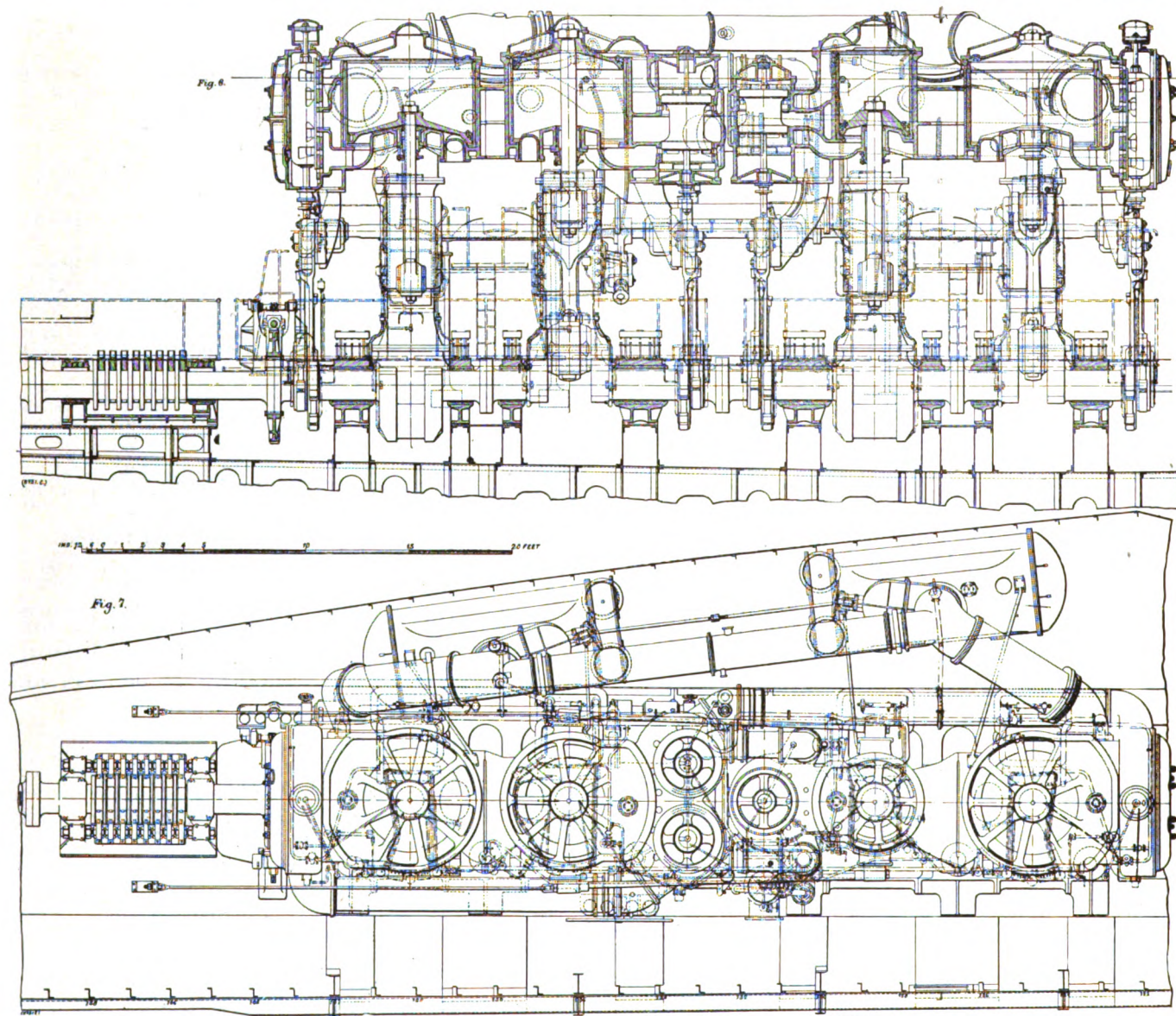


## STEAM TRIALS OF THE CARNARVON

The armored cruiser Carnarvon, the first of the Devonshire class to be completed, has passed through her steam trials, and the results have proved thoroughly satisfactory, the mean speed attained on the eight-hours' full-power trial being 23.3 knots, while only 22.25 knots was anticipated in the design. This result, the particulars of which are derived from *Engineering*, London, is the more remarkable as it closely approximates to the average performance of the earlier cruisers of the County class, which are by no means so well armored, and have a much less powerful armament. The County cruisers were laid down at a time when there was a desire, while

armed only with 6-in. guns—irrespective of the number of such weapons—did not anticipate to any degree the progress in the power and range of enemy's guns.

When the Devonshires were ordered, early in 1902, they were to be the same type as the County cruisers, so far as the thickness of armor and the number and disposition of the guns were concerned; but, following upon the appointment of Mr. Philip Watts as director of naval construction, the designs were considerably modified. The first step taken was to increase the thickness of the armor, the broadside plating being increased to 6 in., instead of  $4\frac{1}{4}$  in., tapering at the forward end to  $4\frac{1}{2}$  in., and at the ram to 2 in. There was a



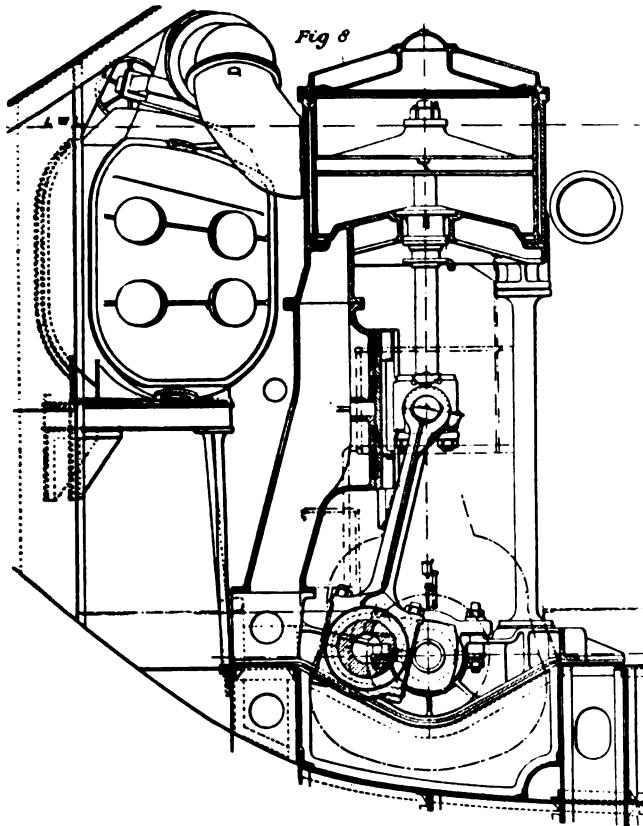
FOUR-CYLINDER, TRIPLE EXPANSION ENGINES OF THE ARMORED CRUISER CARNARVON.

increasing the speed, to decrease the displacement and cost; consequently, the tonnage was limited to 9,800 tons, and a speed of 23 knots was aimed at. In order to meet these conditions, it was decided to have only  $4\frac{1}{4}$ -in. armor on the broadside amidships, reduced to 3 in. forward, and ultimately to 2 in. at the ram; the conning-tower, however, was of 10-in. armor. The armament consisted of fourteen 6-in. guns. Experience has shown that the limitations imposed were not justified. Even at the time the cruisers were built experts were satisfied that  $4\frac{1}{4}$ -in. armor was quite inadequate to resist penetration by 6-in. and 7-in. modern high-ballistic guns, and that the building of a ship costing from £750,000 to £800,000,

corresponding increase in the thickness of the bulkhead at the after end of the main belt, which is now  $4\frac{1}{2}$  in., while the conning-tower has been made of 14-in. armor. The belt extends from well abaft the engine room to the bow; the depth amidships is practically 11 ft., but forward, owing to the sheer of the main deck and the droop of the protective deck towards the ram, this depth is increased to about 15 ft. The early County cruisers had fourteen 6-in. guns; the Devonshires were designed to have two 7.5-in. guns and ten 6-in. guns, the former being bow and stern chasers. But in view of the strong opinion which had developed against the once popular 6-in. gun, because of its limitations in energy



and range, it was decided to increase the number of 7.5-in. guns to four and to reduce the 6-in. guns to six. Thus, in the cruisers of the Devonshire class there are three 7.5-in. bow-chasing guns, one in a barbette on the forecable, and two others in barbettes on the upper deck at the after end of the



ENGINE OF THE CRUISER CARNARVON.

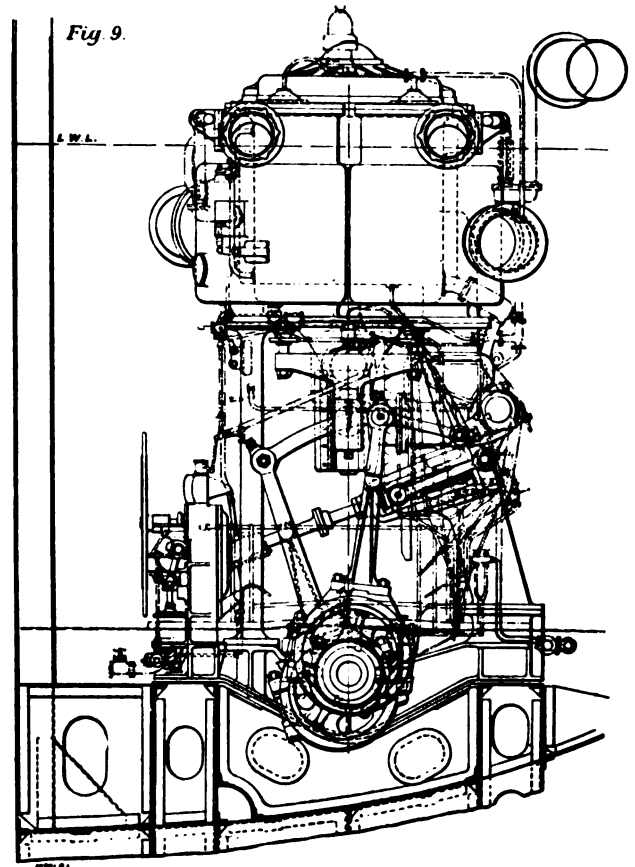
forecable. The bow fire thus becomes approximately fifteen shots of 200 lb. weight, each with a muzzle energy of about 11,600-ft. tons, against forty-two shots of 100 lb. weight, each with an energy of from 5,000 foot-tons to 5,500 foot-tons. In view of the increased energy per shot, no two opinions can be entertained as to the superiority of the bow fire of the Devonshire class. As regards the stern fire, there is mounted on the upper deck one 7.5-in. gun in the barbette, while on each side there are double-story casemates for 6-in. guns, the lower gun in each pair being on the main deck level. Amidships on the main deck there is, on each broadside, one 6-in. gun. It seems, however, doubtful whether the 6-in. guns on the main deck can be fought in any seaway, because, apart from the rolling of the ship, there are always waves, so that the projectile may bury itself instead of ricocheting. It would appear, therefore, as if the four 6-in. guns placed on the main deck in this Devonshire class should have been dispensed with, and additional 7.5-in. guns mounted on the broadside. The smaller guns in the ship include twenty 3-pounder quick-firing guns, and two boat and field quick-firing guns of the 12-pounder 8-hundredweight class, in addition to two Maxim guns.

The alterations made in the various ships have considerably delayed them. Messrs. William Beardmore & Co. are the first to complete one of the vessels of her class, an honor which also fell to them in connection with the completion of the Berwick of the County class. The next vessel to go on trial will be the Antrim, built and engined by Messrs. John Brown & Co. of Clydebank, to be followed by the Devonshire, built at Chatham dockyard; the Hampshire, constructed by Sir W. G. Armstrong, Whitworth & Co., Newcastle-on-Tyne; the Roxburgh, by the London & Glasgow Co.; and the Argyll,

by Scott's Shipbuilding & Engineering Co. of Greenock.

In respect to boiler installation, there was also considerable range, as the plans for these ships were submitted to the boiler committee, and it was decided to adopt various systems of boilers. In all cases part of the installation consists of cylindrical boilers, as first recommended by the boiler committee; but experience has since shown that this is not a desirable procedure. Not only does it involve complications, but it has been proved that the efficiency and economy of the cylindrical boiler are not equal to the results achieved by various types of water tube boilers, working under exactly corresponding conditions in the same ship. The Carnarvon has Niclausse boilers, and cylindrical boilers with the closed stokehold system of forced draft; the Devonshire has Niclausse and cylindrical boilers on the Howden system; the Roxburgh has the Dürr boiler, with closed stokehold forced draft for the cylindrical boilers; the Antrim has Yarrow and cylindrical boilers, both forced on the Howden system; while the same boilers in the Hampshire are on the closed stokehold system. The Argyll has closed stokeholds for the cylindrical boilers, but natural draft is adopted for the Babcock & Wilcox boilers.

The propelling machinery of the Carnarvon consists of two sets of four-cylinder triple expansion engines arranged in



ENGINE OF THE CRUISER CARNARVON.

separate watertight compartments, with a longitudinal bulkhead. The engines were designed to develop collectively 21,000 I. H. P. at 138 revolutions per minute, with a pressure in the boilers of 210 lbs. per square inch. The cylinder covers, pistons and bottom frames are of cast steel. The cylinders of each set of engines are supported at the front by six forged steel turned columns, and at the back by four cast iron rectangular columns, on which are bolted the guides for the piston rod shoe plates. The diameters of the cylinders are: high pressure, 41½ in.; intermediate, 65½ in.; and two low pressure, 73½ in.; all having a stroke of 42 in. All the cylinders are fitted with liners, and are steam-jacketed. The high pressure and intermediate pressure liners are made of solid forged

steel and those for the low pressure cylinders of cast iron. The distribution valve on the high pressure cylinder is of the piston type; the intermediate cylinder has two piston valves, operated by separate spindles connected to a crosshead. Slide valves are provided for the two low pressure cylinders. Starting valves are fitted to the intermediate and low pressure valve casings.

The shafting is hollow throughout; the crankshaft is 18 in. in diameter, with a 9-in. hole; the crank pins are all 20 in. in diameter, those for the high pressure and intermediate pressure being 26 in. long, and for the low pressure 17 in. long. The angles of the cranks are arranged on the Yarrow, Schlick and Tweedy system, to balance the weight of the moving parts. Forced lubrication has been applied experimentally to some of the bearings in the Carnarvon, the intention of the Admiralty being to develop a satisfactory system in connection with the whole of the crankshaft bearings, the main bearings, the crank heads and eccentrics. Messrs. Humphrys, Tennant & Co. have carried out extensive experiments on a large scale at their works, and they have fitted one of the main bearings and one of the crank heads of the Carnarvon with a system of forced lubrication, which, having proved very satisfactory, is now to be applied to all the bearings in the battleship *Britannia*, the engines of which are now being made by the same firm. The oil is pumped into the main bearing, in which it is confined by a species of gland on each end of the bearing. Thence it is conveyed by means of holes to the center of the crankshaft, and in the usual manner to the crank pin, and finally into the crank brasses. The oil is recovered from the crank pit, passed through filters and again pumped through the main bearing in the same cycle. To reduce to a minimum the water required, special glands are fitted to the piston rod, so that any water passing the main gland can pass away to the bilge. In other vessels of the *Britannia* class a different system is to be experimented with in order to obtain experience and to evolve finally the most effective method. In connection with this, Messrs. John Brown & Co., who are building the machinery for the *Africa*, are also carrying out a series of important experiments. The Admiralty are indebted to such firms for devoting their experience and resources for the advancement of engineering in the service.

The system of lubrication of the thrust block in the *Carnarvon* differs from that which we have hitherto seen in connection with naval machinery. The lubrication is in this case entirely effected by means of grooves cut on the collars of the thrust shaft, which, in rotation, dip into the oil contained in the well formed in the lower part of the block. The oil is retained in this by means of small casings fitted between each separate collar. The temperature in the block itself is therefore a fair guide to satisfactory working. The system worked well during the trial of the *Carnarvon* at a temperature which, judged by immersion of the finger point, seemed much greater than that possible under ordinary water cooling.

There are two condensers for each engine.

The one centrifugal pump for both condensers is placed on the upper platform, while on the lower platform there is located a filter tank. The condensers have each 6,575 sq. ft. of cooling surface, and either may be shut off for overhaul, as the other is sufficient. Independent twin air pumps of the Weir type are placed forward of the condenser plant. They draw from the condenser and discharge through grease filters into the feed tank. There is no auxiliary condenser in the ship, the exhaust from the auxiliary machinery being passed into the main condensers or into the closed exhaust system, or into the receiver of the low pressure cylinder of the main engine, or into the evaporator. There is one distiller located at the after end of each engine room; this distiller is capable of taking the total output of both evaporators for making up the boiler feed. In many previous ships the boiler makeup was provided by one evaporator discharging into the main con-

denser; but in this case the evaporating and distilling system is a distinct unit of itself. The advantage of this is that the distiller, taking the whole of the output of both evaporators, gives feed water at a much higher temperature than is the case when it is working in conjunction with one evaporator for the production of drinking water. The rate of output of fresh water is adjusted in each case to insure a high or low temperature of fresh water in the outlet. The engine rooms are identical in arrangement and have donkey and bilge pumps.

The trials of the *Carnarvon* were carried out under the new service conditions, which require that the staff employed and the arrangements on board shall agree exactly with those obtaining when the ship is in war service. Thus all bulkhead doors were shut, the engine room was closed down, the staff was restricted to the service complement, the amount of oil used was limited and no water was permitted on the bearings. Clearances were also prescribed. In view of the severity of these conditions when applied to new machinery, the proportion of power required to be developed on the second thirty hours' trial was reduced from 80 per cent, as in previous cruisers, to 70 per cent of the full power. This is the power which can be maintained as long as the coal may last and can be brought to the stokehold plates. No difficulty whatever was experienced in obtaining the results, and as regards the temperature of the closed down engine room, the highest reading—and that for a short period only—was 90° Fahr., while in the ammunition passages and other parts of the interior it was 75° Fahr. The outside temperature was, if anything, higher than is usual at this period of the year. The ease with which ship after ship is passing through her trials under the new conditions clearly shows that no trouble need be anticipated even in running for 30 hours at 80 per cent power, and in the future the sea-going engineer will not be able to point to any favorable circumstance during trials in extenuation of any inability to maintain the legend speed in service—an excuse sometimes, although not often made.

On the first trial, which was of thirty hours' duration, the vessel steamed from the Clyde to Portsmouth and experienced very severe weather, the wind blowing with a force of 10 for the greater part of the time. The steaming results were satisfactory. The mean power was 4,756 H. P., while the coal consumption worked out to 2.11 lb. per indicated horse power, and the loss of water to 2.14 tons per 1,000 indicated horse power per 24 hours. Before returning to the Clyde the vessel proceeded to the English channel to carry out her gun trials, with a view of testing the mountings and adjacent ship structure. The gun mountings were fitted by Sir W. G. Armstrong, Whitworth & Co., and gave every satisfaction, while the ship withstood the stresses splendidly.

The second trial of thirty hours' duration was carried out when the vessel was returning to the Clyde. This trial took place on Tuesday and Wednesday of last week, and again very severe weather conditions were met with, the wind being of force 8 to 10. There was an air pressure of 0.4 in. in the stokehold with cylindrical boilers. The power developed was 15,212 indicated horse power, the coal consumption being 1.78 lb. per horse power hour, and loss of water 2.31 tons per 1,000 indicated horse power per 24 hours. The contract required that during this run the power should be 14,700, which, it will be noted, was exceeded by 500 horse power. During this trial, on the 8th inst., two runs were made on the measured mile at Skelmorlie on the Clyde. On the first run the engines made 132.8 revolutions, and developed 15,304 indicated horse power, which gave a speed of 22.195 knots. On the second run the mean revolutions were 129.6, the power developed being 15,398, while the speed was 20.666 knots. The mean results were: Revolutions, 131.2; power, 15,351 indicated horse power; speed, 21.43 knots. The displacement when the vessel was running the mile was 10,500 tons. The later cruisers of the County class made on this trial a speed of about 22 knots,

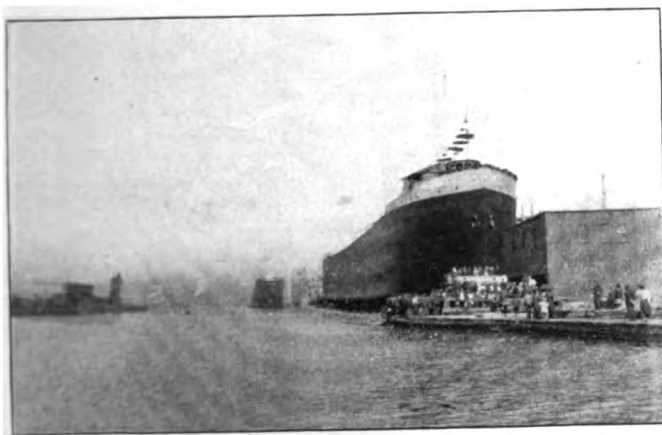
with about 16,200 indicated horse power, so that the Carnarvon has done exceedingly well, because not only is the power and aggregate coal consumption less, but the displacement was 1,700 tons greater. The increased armor and armament has thus been bought for a small forfeiture in speed—about half a mile per hour with the same power as in the County class.

The full power trial took place when the weather was unpropitious, a wind force of 4 to 6 blowing, with frequent squalls of long duration of force 10. On this trial the vessel started a little in excess of her designed displacement, and when four hours had elapsed she was put on the measured mile at Skelmorlie. It was then slack tide, so that the only interference was due to the wind. The mean speed was 23.3 knots, the engines having made 142.3 revolutions and the indicated H. P. was 21,322. The highest speed got with any of the vessels of the County class was 24 knots, with 22,881 I. H. P.; and here again the performance of the Carnarvon must be regarded as satisfactory, for the loss in speed is only 0.7 mile per hour, notwithstanding that the power is 1,500 I. H. P. less, and that the displacement is 1,000 tons more. A high propulsive efficiency seems to have been attained, which is due partly to increased length and to the propellers. These are of Stone's manganese bronze, 15 ft. 9 in. in diameter, each having three blades, set at a pitch of 19 ft. 6 in. The total blade surface in each propeller is 80 sq. ft.

The water tube boilers, which, as already indicated, are of the Niclausse type, as fitted and proved satisfactory on board the Berwick and Suffolk, gave plenty of steam and involved no trouble, the automatic feed working very reliably. The steam pressure at the boilers was 202 lb. and at the engines 173 lb. The cylindrical boilers required an air pressure of 0.7 in., and even then did not maintain their fair proportion of steam at full pressure. The vacuum was 25.75 in., and the average power for the eight hours was 21,489 indicated horse power. The coal consumption worked out at 2.29 lb. per indicated horse power per hour.

#### LAUNCH OF THE WILLIAM A. PAINE

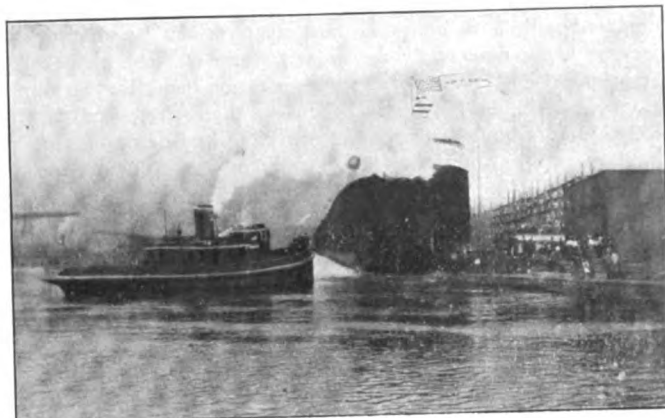
The steamer William A. Paine building for the Pioneer Steamship Co. of which Capt. Charles L. Hutchinson of Cleveland is president, was launched at the Cleveland yard of the American Ship Building Co. on Thursday afternoon last. Miss Ruth Paine, daughter of Mr. W. A. Paine of Boston, president of the Copper Range Consolidated Co., christened



THE WILLIAM A. PAINE ON THE STOCKS.

the boat in honor of her father. Mr. Paine is one of the largest consumers of coal in the upper peninsula of Michigan. The new steamer is 500 ft. over all, 480 ft. keel, 52 ft. beam and 30 ft. deep and is equipped with triple expansion engines 22½, 36 and 60-in. cylinder diameters by 42-in. stroke. Steam will

be furnished by two Scotch boilers 13 ft. 9 in. in diameter and 11 ft. 6 in. long, allowed 180 lbs. steam pressure. She will be



THE LAUNCH OF THE PAINE.

ready to go into commission about Aug. 1 and will be commanded by Capt. Wm. P. Benham. Among those who witnessed the launch were: Mr. and Mrs. Wm. A. Paine, Miss Ruth Paine, Miss Esther Paine, Mrs. Elisha Cark, Jeremiah Williams, Phineas W. Sprague, Arthur L. Robinson, Arthur W. Clapp, Elmer A. Lord, George W. Waterman, Frank H. Gage and Charles H. Paine of Boston; S. L. Smith, J. H. Seager and Cameron Currie of Detroit; R. I. McKiver, J. R. Dee of Houghton; Edward Smith of Buffalo; Mr. and Mrs. D. R. Hanna, Mr. and Mrs. James C. Wallace, Mr. Robert Wallace, Capt. and Mrs. Charles L. Hutchinson, Mr. R. C. Wetmore, Mr. J. I. Hutchinson, Mr. Charles Meyers, Mr. Jean



MR. W. A. PAINE.

Smith, Mr. Harry Levan, Mr. W. E. Mulcahy, Mr. W. H. McGean, Mr. Martin Mullen and Mr. W. Akers of Cleveland. A dinner was given at the Tavern Club by Messrs. D. R. Hanna, R. L. Ireland and Martin Mullen on Thursday evening in honor of the event.

# Electrically Operated Coal Handling Plant

The advantages inherent in the use of electric cranes, as compared with both hydraulic and steam-driven hoisting devices, is being universally recognized at the present moment, the principal good points of electric operation being that power is supplied simply by means of a few thin wires, and that electro-motors have a relatively low weight and occupy a very small space. It is thus possible to employ three distinct mo-

In the following we illustrate some typical cranes used in connection with coal-handling plants in Germany. The photographs are kindly supplied by the Gesellschaft für Elektrische Industrie, of Karlsruhe i/B, Germany, who are the builders of the cranes illustrated.

In coal-handling plants, coal has mostly to be transferred from ships either immediately into railway cars or else on to



FIG. 1. ROTARY GRAB CRANE CONSTRUCTED BY THE GESELLSCHAFT FÜR ELEKTRISCHE INDUSTRIE FOR KARLSRUHE HARBOR.

tors, corresponding to the three main movements of the crane (lifting, turning and traveling), so that all the complicated gearing which formerly was necessary, giving rise to frequent trouble, is entirely dispensed with. A three-motor crane has obviously the least complicated gearing, showing the smallest power consumption, as each chief movement has its own mo-

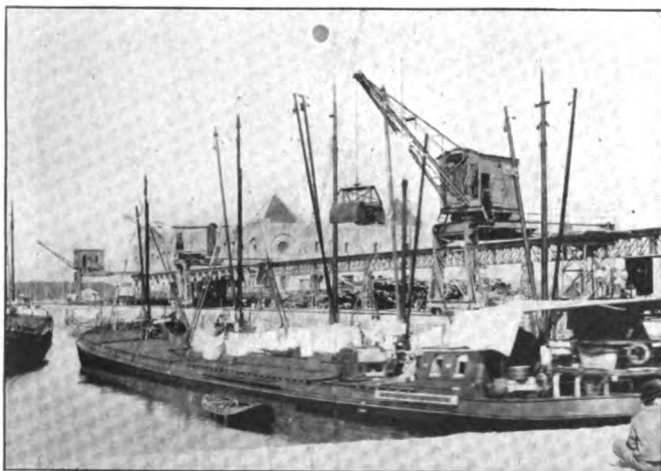


FIG. 2. DOCK CRANE KARLSRUHE HARBOR.

tor. The latter is in each case accurately adapted to the work required, that is to say, a powerful one for lifting the load, while smaller motors are quite sufficient for the other two movements. As each motor is operated only during the time it is actually working, there is no useless consumption of current. It should be borne in mind also that each of the three movements being independent of the other, two or three of them can be effected simultaneously, thus ensuring a great saving in time, the load being always carried on the shortest possible way. In many cases it even becomes desirable to construct four motor cranes, fitted with two hoisting motors, one for heavy and a smaller one for lighter weights, which can be raised with greater speed.

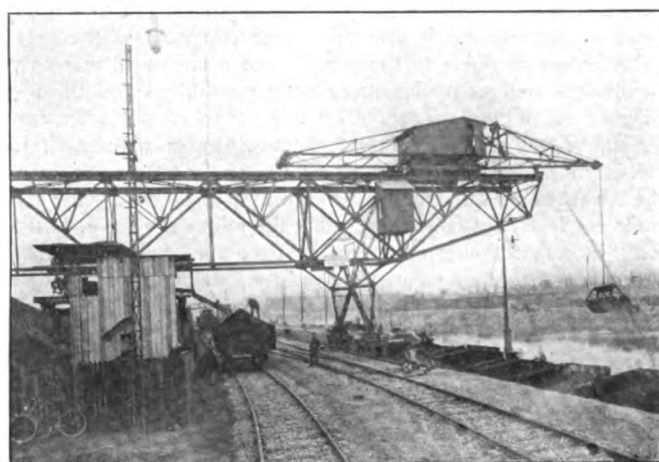


FIG. 3. BRIDGE WITH TRAVELING ROTARY CRANE.

a greater coal ascent. In the case of direct unloading from the ship into cars or lighter ships, there are used, according to local conditions, either simple rotary cranes or dock cranes, both being designed for grab operation. Stationary or traveling rotary cranes should be used wherever the embankment is not taken up by railway tracks throughout its breadth, or

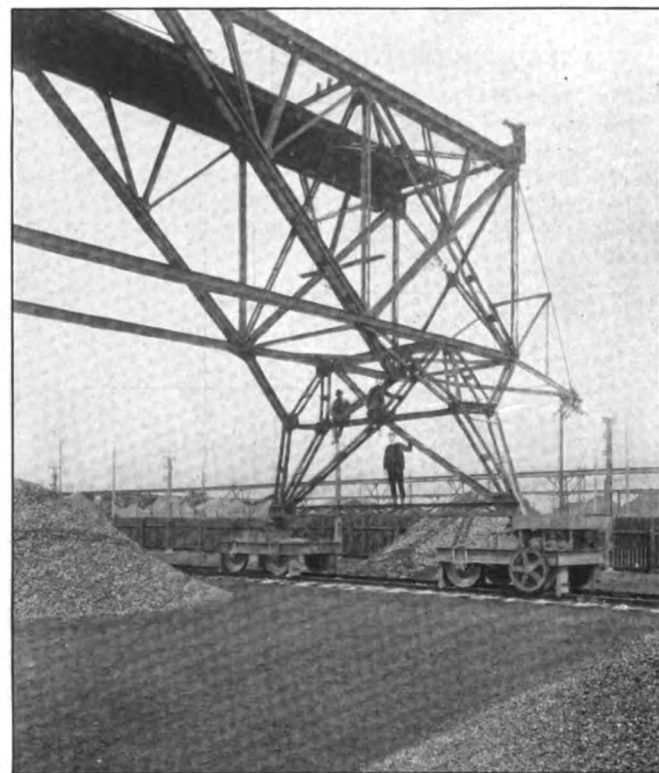


FIG. 4. BRIDGE WITH TRAVELING ROTARY CRANE.

where local conditions enable supporting walls for the laying out of crane tracks to be provided. Dock cranes, on the other hand, are to be preferred whenever the railway tracks





LAUNCH OF THE STEEL CORPORATION STEAMER GEORGE W. PERKINS AT THE WEST SUPERIOR YARD OF THE AMERICAN SHIP BUILDING CO.

run immediately along the edge of the embankment, the frame leaving room for a single or double track railway. Fig. 1 shows a rotary grab crane constructed by the Gesellschaft für Elektrische Industrie for the Karlsruhe Harbor. Fig. 2 represents a dock crane supplied for the same harbor. This crane is driven by an enclosed electro-motor through worm and wheel-gearing; the electro-motor is controlled from the driver's cabin. The dimensions of the framework have been so designed as to leave room for the two tracks of the railway.

The jib turns on a circle of rollers. A rotary current motor of 50 H. P. operates the chain drum for the load chain. In the lateral shields has further been located a rope drum being rotated by a weight and controlled by the brake; it serves for the operation of the automatic grip. The crane is rotated through worm and toothed-wheel gearings by an electro-motor which is also installed on the common base plate.

The crane cabin is a water-tight iron structure with wood lining and corrugated sheet roofing. The crane can be clamped on the rails so as to render any tilting impossible even in the case of an excessive load. On the motor axle and on the intermediate shaft of the hoisting grab there have been installed band brakes for absorbing the power of the motor when thrown out of gear, and for maintaining the load in any desired position. These electro-magnetic brakes are automatic and come into operation whenever the current is interrupted. As soon as the current is thrown in the brake action is discontinued instantaneously. In order to allow of the hoisting motor being disconnected automatically, both at the highest and lowest positions of the load, the extension of the drum-shaft has been provided with a thread on which cams are made to travel. In the two limiting positions of the load these cams, striking an adjustable stop on the thread, will move along a socket, and by operating a switch cut off the current. The lever of the controller is moved upwards from its horizontal position if the load is to be lifted, and downwards if the load is to be lowered. By turning the lever in the same direction, the crane is swung either to the left or right. The lever can be moved simultaneously in a vertical and horizontal direction, corresponding to a simultaneous lifting and swinging movement of the crane. Should the crane

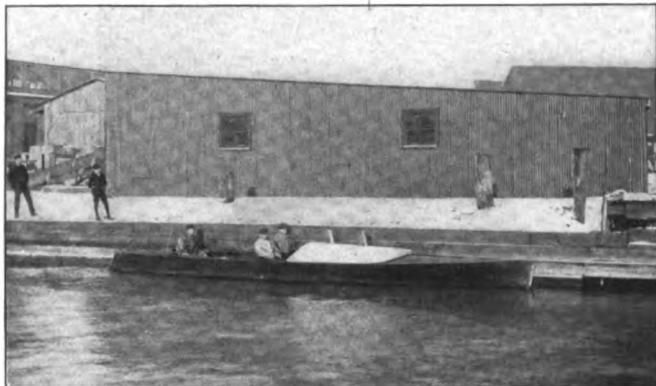
have to be moved in a longitudinal direction, the controller is thus switched on to the crane-traveling motors so as to have the traveling motion perfectly correspond to the movement of the lever, without there being any alteration in the steering movement as regards the lifting and lowering of the load. As the crane does not travel and rotate simultaneously, this steering method is both simple and cheap.

During the raising and lowering motions the grab of the Jaeger system is carried only by the load-chain proper, whereas the two discharging ropes follow the rising and dropping motion of the load, being wound on or off the rope drum. In case the grab has to be opened in any position, this rope drum is stopped by means of a hand-operated brake lever and the load chain dropped so that the grab is now suspended from the discharging ropes, whereas the load chain running out causes the two grip shovels to open. The grab is locked by lifting the load chain.

The contact conductors are arranged laterally on the upper crane rail. For the three bare conducting wires, and placing them at sufficient distances well insulated and protected against any contact with the load hook or load chain, there was a relatively small space available. This difficulty has been overcome by placing the upper and lower current collecting rollers at 45° with respect to one another from the transformer column, the current is supplied through a cable ending in a terminal attached to the rail bridge and is led on by contact rings and brushes to the switch board situated in the driver's cabin. By means of these cranes the coal is discharged into cars directly, or by the aid of a hopper. The coal frequently has first to traverse a shaking sieve, combined with a discharging hopper, which sorts it into round, small and fine pieces. In the case of direct discharging into railway cars the latter can be weighed immediately by means of a car-weighing machine. The individual cars are ranged in trains by the aid of electric capstans. The bridge represented in figures 3 and 4 is 67 in. in length, having a traveling rotary crane to lift 4 tops, 25 cu. in. grab capacity, electrically driven sieve, electrical capstan for hauling the wagons and a wagon weighing machine. Its capacity is from 40 to 50 tons per hour.

## OLDS RACING MOTOR BOAT

The accompanying plans and photographs are those of a racing motor boat built by the Olds Motor Works, Detroit. The boat is of the following dimensions: Length over all 35 ft., length load waterline 34 ft. 6 in., beam extreme 4 ft. 6 in., depth amidships 2 ft. 3 in. She is built with a double skin, the inner one being  $\frac{1}{8}$  in. thick and the outer one 3-16 in. mahogany. The frames in general are  $\frac{1}{2}$  in. by  $\frac{3}{4}$  in. with some heavier ones in the neighborhood of the engine. The

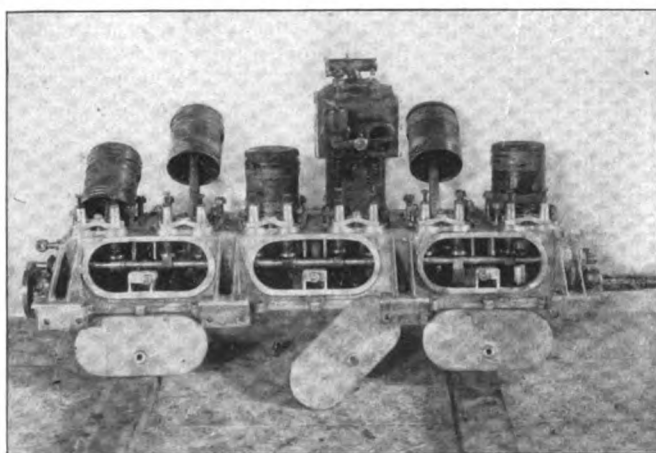


THE OLDS RACING MOTOR BOAT.

keel is of white oak in one piece, and the engine floors and beams are also of oak. The engine logs are continued for some distance aft of the engine and are reduced with a gradual taper, thus giving the vessel a stiff bottom.

The decks are of mahogany 3-16 in. thick, the forward deck line being continued in the form of a light movable cover to the after end of the engine. The forward cockpit contains the engine and a seat at the after end for the helmsman and engineer. She is steered by an ordinary automobile steering wheel. The after cockpit contains seats for passengers.

The motor is of the six-cylinder, vertical type, having intake and exhaust valve side by side. The crank case is of aluminum and to the upper half are bolted caps for all main bearings. These bearings are of bronze as are also the bushings for the wrist pin end of the connecting rod. The lower



THE ENGINES OF THE OLDS MOTOR BOAT.

half of the case is an oil pan only and extends fore and aft completely enclosing all main bearing caps in such a manner that the leakage from the end bearings is thrown off into the pan by means of pressed steel rings. The six throw crank is of nickel steel, carries at the front a flywheel and at the rear a flange bolted to the short section of shafting carrying the transmission. The bearings are of generous proportion and are lubricated by a constant flow of oil supplied by a gear

pump driven from the cam shaft. So nicely are the reciprocating parts balanced against each other that at 1,000 revolutions the vibration can scarcely be detected in the boat. The cylinder dimensions are 5 in. bore by 5 in. stroke and the power developed is easily between 50 and 60 H. P. The cylinders are fitted with the auxiliary exhaust so long a familiar feature in the construction of the Olds stationary engines. One carburetor supplies the gas for all cylinders. The ignition is of the high tension type, using the accumulator and spark coil. The entire control of the motor, comprising the throttle, the spark advance and the electrical switch, as well as the lever for operating the "go ahead" and "back up" is placed convenient to the hand of the driver. The entire arrangement resembles greatly that of the modern automobile and the operation is as simple as that of any "runabout."

Unfortunately the first vessel on these lines was burned just as she was completed, so that the present one did not come out until November last. Owing to the lateness of the season, it was impossible to get any good speed trials, as the time was devoted to getting everything about the engine tuned up. The boat, however, has done something better than twenty miles, and is expected to improve this when everything is in shape.

This trim little craft is the property of Mr. Fred L. Smith, of the Olds Motor Works. The hull was designed by Prof. Herbert C. Sadler, of the University of Michigan, and the engine designed and built under the direction of H. E. Coffin in the experimental department of the Olds Motor Works, Detroit, Mich.

## CHICAGO GRAIN REPORT

Chicago, July 1.—The early shipping demand during last market period was fairly active but latterly cash conditions turned slow and vessels in immediate cargo requirement found it necessary to charter on the basis of  $1\frac{1}{4}$  cent per bushel Buffalo corn with the same rate ruling to Georgian Bay and common points, with 4 cents through to Montreal. Shipments of the week were distributed about as follows: Via all rail lines 97,000 bu. wheat, 410,000 bu. corn, 565,000 bu. oats: Via lake to Buffalo and other American ports of wheat 130,000, of corn 1,880,000 bu., of oats 80,000 bu. And lake routing to Canada points 670,000 bu. corn and 205,000 bu. oats.

Lake and Rail Shipments—

	This week.	Last week.	Same week last year.
Wheat .....	243,609	161,728	157,844
Corn .....	2,970,247	2,381,411	1,236,281
Oats .....	851,504	1,201,526	579,638
Rye .....	9,200	13,671	11,300
Barley .....	19,142	34,220	9,430
	4,093,702	3,792,556	1,994,493

Lake and Rail Shipments—

Since Jan. 1, 1905.

		Same time last year.
Wheat .....	6,563,056	6,758,126
Corn .....	44,354,134	30,069,992
Oats .....	25,303,592	23,614,355
Rye .....	593,652	781,967
Barley .....	2,302,257	2,601,000
	79,116,691	63,825,440

Capt. J. W. Hunt of Cleveland, master of the steamer James Watt was operated upon for appendicitis at Painesville this week and is in a serious condition.

Supt. Joseph Ripley in charge of the St. Marys river district has been appointed a member of the board of consulting engineers for the Panama Canal.

## ITEMS OF GENERAL INTEREST

The torpedo boat Farragut, which has been out of commission for two years, is to be repaired at the Mare Island Navy Yard, California, at a cost of about \$4,000.

The battleship Vermont will be launched from the yard of the Fore River Ship Building Co., Quincy, Mass., on August 31. Miss Jenny Bell, daughter of Governor Charles J. Bell of Vermont, will christen the new battleship.

The Allan Line turbine steamer Virginian has made the eastward passage from Rimouskie to Moville in six days, two hours and fifteen minutes. This is the best passage ever made over the route.

The annual report of Cramps shows the gross business of the year ending April 30 to be \$7,383,308. The profit was \$777,702, leaving a net profit after deducting interest and all other charges of \$314,165.

The Fore River Ship & Engine Co., Quincy, Mass., is building a steel steamer for the Bay State Fishing Co. This will be the first steel steamer to be built in this country for fishing purposes. It is understood that additional orders are pending.

Minor repairs are being made on the Russian converted cruiser Lena, which has been interned at the Mare Island Navy Yard, California, for several months. The work is being done by mechanics employed by the Union Iron Works of San Francisco, which made the lowest bid.

Work has been begun on the new government dry dock at the Mare Island Navy Yard, California, by the Construction Company of Philadelphia, which has the contract. Contracts have been made for the sand, lumber and stone and a large hydraulic dredger will soon be at work. About three hundred men will be employed.

Storm signals, similar to those already installed at the Golden Gate and on the Farallone Islands, are to be placed in position at Goat Island in the bay of San Francisco and at many other points on the Pacific coast. All the materials necessary for their construction are to be supplied by the Mare Island Navy Yard, California.

A banquet was given in Youngstown last week in honor of the formation of a new chamber of commerce. The discussion at the banquet took the form of an endorsement of the proposed ship canal to connect the Ohio river with Lake Erie at Ashtabula. The principal speaker of the evening was Mr. John Shaw of Pittsburg who for a number of years has devoted himself to the construction of such a canal. Other speakers were Col. J. J. Sullivan, president of the Central National Bank of Cleveland and Judge W. R. Taylor of the United States district court at Cleveland.

The Panama Canal Commission after sending a commissioner abroad to purchase two ships for service between the United States and Panama, concluded that they could find vessels more adaptable to the service in the United States. The commission has therefore purchased from the Ward Line the steamers Mexico and Havana at \$650,000 each, which is considerably less than the original cost of the vessels. These vessels are of 5,500 tons capacity and are capable of sustaining a speed of 16 knots. They can carry 100 first class and fifty second class passengers and have every facility for the handling of cargo.

The Eastern Steamship Co. of Boston, Mass. is to build a turbine steamer of the character and general appearance above the waterline of the Calvin Austin of that company. The new steamer will be of steel and will be 300 ft. over all, 51 ft. beam and 20 ft. 6 in. deep. Her engines will be of the Parsons type of turbine of 5,000 H. P. and will be built by the W. & A. Fletcher Co., of Hoboken, N. J. The hull will be constructed at Roach's ship yard, Chester, Pa. and the joiner work by C. W. Englis, New York. Her interior finish will be similar to the C. W. Morse of the Hudson Navigation Co.'s fleet, that is she will be paneled throughout with com-

pressed fibre, a finish which is much in vogue at present. She is to be completed within fifteen months.

## AROUND THE GREAT LAKES

A new chart in colors of the south end of the Lake Superior has just been issued by the United States Lake Survey office and is for sale by the *Marine Review*.

Capt. W. H. Baker of Detroit has secured the contract for raising the dredge owned by the L. P. & J. A. Smith Co. of Cleveland which foundered last week off Rocky river.

Capt. D. C. Craine, formerly master of the steamer Ball Brothers, will command the new steamer Socapa building for G. A. Tomlinson of Duluth at Bay City.

The Gilchrist Transportation Co. of Cleveland has closed the contract with Capt. W. H. Baker of Detroit to raise the steamer City of Rome which was sunk in the St. Clair river near Tashmoo dock.

The new steamer building for use of the government engineers at Craig's ship yard was launched last week. The boat is 70 ft. long and 20 ft. beam and is intended for service in St. Mary's river.

Capt. George Weaver has resigned the command of the steamer Pine Lake and has purchased an interest in the passenger steamer Lou A. Comings, running between Charlevoix and Boyne City.

A record was made last week in loading the steamer Philip Minch at the Ellsworth dock, Cleveland. The steamer was loaded with 9,260 tons of coal in 9 hours, 35 minutes. She also took on 310 tons of fuel meanwhile.

While the complete report of Sault Ste. Marie commerce is not yet at hand, it is known that the June record has broken all previous records in the history of the canals. The net tonnage for the month of June was 6,057,491 tons.

The total receipts of lumber at the Tonawandas during June were 62,890,855 ft. or an excess of 45,000,000 ft. over the corresponding period last season. This discrepancy is accounted for, however, by the late opening of navigation last year.

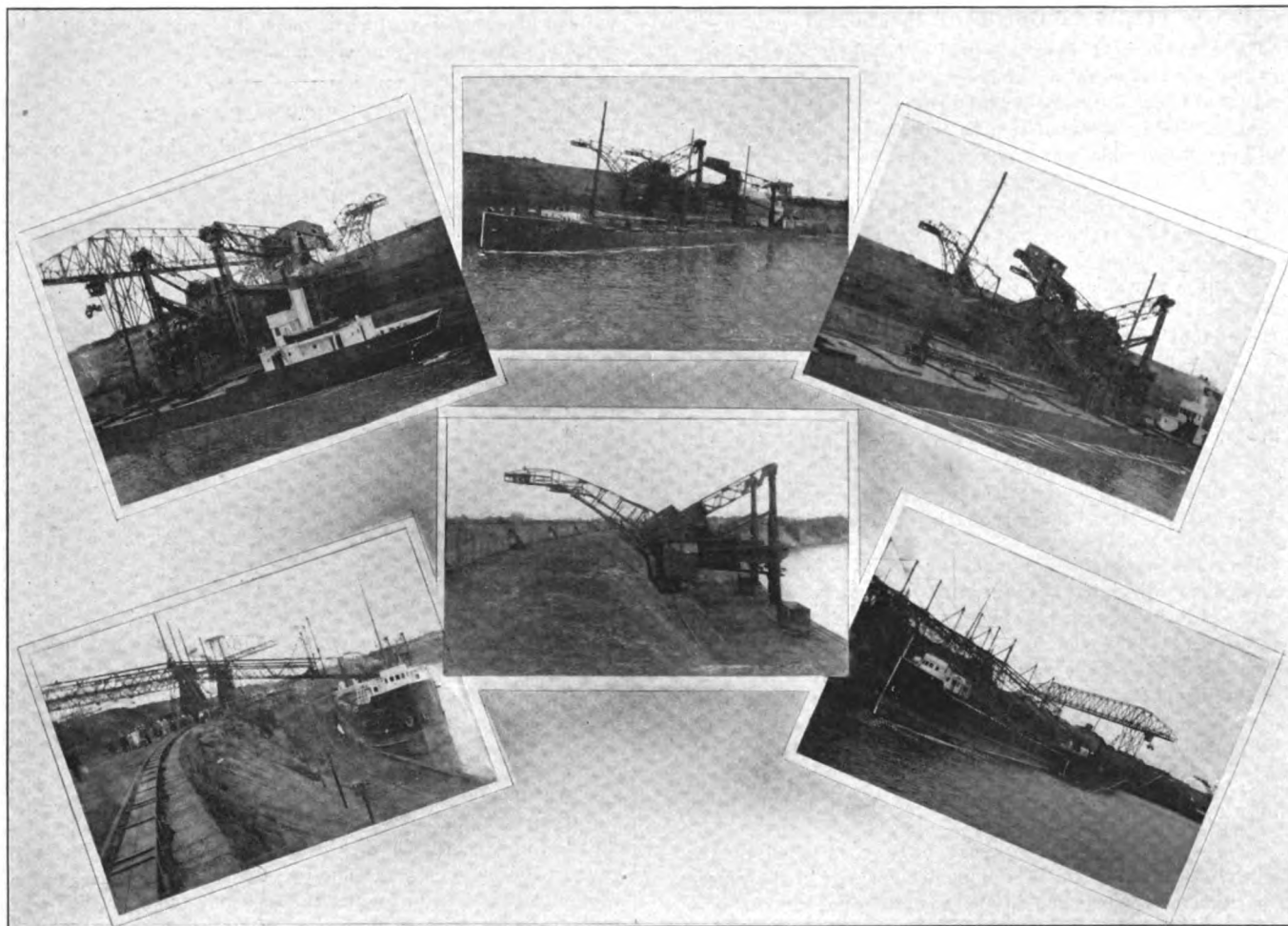
The steamers George Spencer and Aurania were in collision on Sunday while running on the Ecorse range. Both boats were upbound and the Aurania's quarter struck the Spencer on the port side abreast of the engine with considerable force. The damage, however, is not serious.

While lying at Anchor in St. Clair river near Marine City last Friday morning, the steel package freighter Ramapo was rammed by the steel steamer Brazil and damaged above the water line. Several of the Ramapo's plates on the port bow were broken as well as a number of frames. The Brazil was also damaged but not seriously.

The schooner Selkirk was sold last week to Graves & Stevens of Cleveland to be used in the contracting business. The Selkirk was the property of J. P. Chapman of Cleveland and F. P. Bins and Capt. Bullock of Lorain. The Selkirk is one of the oldest schooners on the great lakes, having been built forty-three years ago at Wallaceburg, Canada.

James McNelley, 35 Poplar street, Philadelphia, is the manufacturer of the American boiler compound for removing and preventing grease and incrustation or scale and preventing corrosion and pitting in steam boilers. The compound is guaranteed to be free from all acids and other injurious components and oil which invariably causes overheating, leakage or burning of plates, tubes and flues. It is represented that the American boiler compound will not only remove all scale and incrustation in the boiler but prevent new from forming and will, if properly, used, keep the boiler absolutely clean and free from all forms of corrosion. Mr. McNelley has issued a little catalogue giving direction for the use of the compound which will be sent to anyone interested.





UNLOADING FACILITIES AT THE STEEL PLANT, LORAIN, O. THREE VIEWS OF THE STEEL CORPORATION BARGE MAIDA UNDER THE FAST PLANT. STEAMER CHRISTOPHER AT UNLOADER WHILE TAKING ON FUEL AND THE FAST PLANT STANDING IDLE.

## American Government Fleet of Chinese and Japanese Built Vessels

Below are presented some extracts from the report of the Philippine commission showing that the United States government has spent \$1,205,265 in building vessels in China and evidently got very poor value for their money. The contracts were let with Chinese bidders because they bid lower than American bidders but it would have been economy nevertheless if the orders had been placed with American ship building concerns. It merely adds further proof of governmental hostility to the ship building industry of the United States.

### EXTRACTS FROM 1904 REPORT OF THE PHILIPPINE COMMISSION.

The bureau of coast guard and transportation created by act No. 266, of the Philippine commission has under its control lighthouse maintenance and construction, and is also charged with the duty of operating a fleet of small government vessels called coast guard cutters, seventeen in number. These vessels are used in transporting insular, provincial, and municipal officials and employees, government supplies, carrying the mails, and preventing smuggling. The bureau has also under its control, in so far as relates to the selection of officers and crew, the furnishing of supplies and keeping in repair a number of small seagoing launches, used by the constabulary and provincial officials in the performance of their duty.

One of the principal difficulties with which the commission has had to contend has been the lack of means of speedy and cheap communication between the various towns and islands of the archipelago. Internal communication in the larger islands

is slow and difficult because of lack of railroads and highways, and between the islands because of irregularity and uncertainty in the movements of merchant vessels. The great mass of the population at present is found along the coast line, the interior of the islands being as a rule sparsely populated. This is not due to any lack of fertility in the soil of the interior, or in its lack of suitability for cultivation and habitation, but solely to the difficulties of transportation and intercommunication; nor will there be any substantial change in this regard until the larger islands are opened up through the medium of railroads. The commission, therefore, appreciating the importance and, indeed, the absolute necessity of having some means of easy and reliable communication with all coast points in the islands, determined to purchase a sufficient number of small vessels for that purpose.

The bureau was organized immediately after the passage of the act with Commander (now Capt.) A. Marix, United States navy, in charge.

After careful study of the requirements of the situation, both as to the number and character of the vessels needed, it was determined to purchase ten single-screw composite vessels having a length of 148 ft.; beam, 28 ft.; maximum draught, 9½ ft.; minimum draught, 8 ft.; displacement, 400 tons; deck house for the accommodation of twelve passengers, to be of hard wood; hull to be of teak wood sheathed with copper, and an economical speed of 10 knots; and 5 vessels having twin screws; length, 138 ft.; beam, 24 ft.; maximum draught, 8 ft.; minimum draught, 7½ ft. They were all to have steel



frames, teak hulls, and copper sheathing, with accommodations for passengers. Each of these vessels was to have a freight-carrying capacity of about 150 tons, and to be able to keep the sea in any weather.

After soliciting bids in the United States, Japan, and China, contracts were let for the ten first-named single-screw vessels to Farnham, Boyd & Co., ship builders, Shanghai, they being the lowest and best bidders; and for the five twin-screw vessels contracts were let to the Uraga Dock Company, near Yokohama, Japan.

The commission would have much preferred to give these contracts to American ship builders, but the only bid received from that quarter was about twice as high as from Farnham, Boyd & Co. and the Uraga Dock Co., a difference so great as to impel the commission, notwithstanding its preference for American ship builders, to let the contracts as stated.

Farnham, Boyd & Co. delivered the vessels which they had agreed to build in due course. They were on the whole very satisfactory, being built upon an admirable model, were very substantial, and considerably faster than the contract required. We were not so fortunate with the Uraga Dock Co. Although highly recommended as competent and reliable ship builders, events did not justify their reputation.

The insular government selected an inspector of reputed capacity and integrity to be on hand during the construction of the vessels to see that they came up in every particular to contract requirements, which were specific and rigid. He, however, proved to be either incompetent or faithless, and, indeed, both. He was induced by the company to accept as up to contract requirements two of the vessels which were first completed. When they arrived in Manila it was found that their model was not good; that the vessels trimmed badly, being down by the head, and as a result were unable to make the contract speed in anything like a heavy sea; and also drew too much water. There were other minor defects which need not be enumerated. The other three vessels were still in course of construction. Pursuant to the contract partial payments had been made at certain stages of completion of the vessels on the certificate of the inspector. When the defects above referred to were discovered there had been paid on the five vessels an aggregate sum of \$214,789.79. We held, however, as a guarantee of faithful performance the check of the company for \$31,000. The inspector who was thus derelict was discharged and a competent man put in his place. Investigation showed that the three vessels which were in the course of construction, by reason of the faultiness of their model and other defects, would not come up to contract requirements, nor would they meet the purpose for which they were especially designed, although they would have doubtless proven fairly good vessels with some minor changes and modifications.

In view of all this the Uraga Dock Co. was notified that the three remaining vessels would not be accepted nor would we pay any further sums of money until they were delivered in Manila for trial and shown to be up to contract, and that unless this was agreed to we should insist on canceling the contract. The company sent one of its chief officials to Manila for conference. He claimed that the most vital of the defects complained of were due to changes made in the original plans by verbal direction of Capt. Marix and our inspector, and consequently that they were not to blame in the premises. We became satisfied that the vessels could not be made to fully answer our purpose, and for reasons which need not be here further detailed and enumerated, we were indisposed to continue the contract. Finally, after considerable negotiation, as litigation in Japan, under all the circumstances, seemed unprofitable and dubious, it was decided that it was in the public interest to make a final settlement of the matter, which was done by agreeing that the insular government should be released from obligation to take the three remaining vessels,

then partially completed, the company to surrender to us the certified check for \$31,000, which was held by the insular treasurer, and to retain all moneys which had been paid.

The net result of this transaction was the loss of about \$30,000 to the insular government, but it was believed, all things considered, better to pocket this loss rather than continue the contract. One of the main inducements to this course was the urgent need which we had for suitable vessels and the consequent importance of placing an order for them elsewhere.

Accordingly the insular government placed another contract with Farnham, Boyd & Co., for five vessels of the same class and type as the first ten vessels which had proven so satisfactory. All these vessels have now been delivered and are being operated along routes and upon schedules so arranged as to give a regular service at short intervals to all points in the archipelago. Through their instrumentality the insular government and the various bureaus thereof are able to keep in fairly close touch with all points in the islands, however remote; they furnish transportation for government mails and freight and quick transfer from one point to another when necessary of detachments of constabulary and other government officials and employees, and besides are valuable for coast-guard purposes in preventing violations of the customs law. They have proven especially useful during the last few months in the distribution of government rice. Each of these vessels has a small armament consisting of a gatling and colt rapid-firing gun, together with a number of small arms, so that they can be utilized if needed in suppressing disorder. They have cost in the aggregate \$1,057,000 and involve an annual outlay in their operation and maintenance of about \$500,000. They have proved to be a wise investment, both from the standpoint of economy and efficient administration and indeed are indispensable.

"This bureau is now operating seventeen steamers, six sea-going launches, one river steamer, six river and harbor launches, and one sailing sloop. The coast-guard cutters, as the steamers are called, are kept continually in use, and perform excellent service in providing transportation for government officials, carrying supplies, expediting and rendering possible the movement of the various government agents to the less accessible parts of the archipelago. There are now eleven routes upon which regular trips are made, five of which have headquarters at Manila. During the fiscal year ending June 30, 1904, the various steamers and launches of the coast-guard service traveled over 350,000 miles, visited over 4,000 ports, carried over 15,000 passengers, and over 5,000 tons of freight, including 5,000,000 pesos in cash."

In the 1903 report of the Philippine commission, the following special report of Lieut. Comdr. J. M. Helm, U. S. N., Chief of Bureau of Coast Guard and Transportation, is submitted:

"By request of the secretary of commerce and police, the commandant of the United States navy yard at Cavite has very kindly consented to allow our boats to go to that yard and be repaired at cost price, when it will not interfere with the work of the navy. The Masbate was hauled out on their ways and repairs made at a very moderate cost, and the Basilan, Corregidor, Busuanga, Polillo, and Luzon have had their bottoms examined and a few sheets of copper replaced by the navy yard divers. It was discovered that for some reason the copper had come off the sternpost and rudder to a considerable extent on all vessels. In this connection the Tablas has been examined by divers on her station at Jolo and some copper sheets replaced there. It is intended to send the remainder of the ten Shanghai cutters to the navy yard for the aforementioned purpose, one at a time, as rapidly as practicable.

"At the beginning of the fiscal year there were under control of the bureau the seagoing launches Ranger, Rover, and

Scout, all maintained for the use of the constabulary, the harbor launch George Tilly, and the small river launches Pepe and Tender. They are still in the service, with the addition of the launches Suerte and Julia, which are held on memorandum receipts from the quartermaster's department.

"The Ranger was originally known as the Lung Kiang. She was bought from the firm of Castle Bros., Wolf & Son for

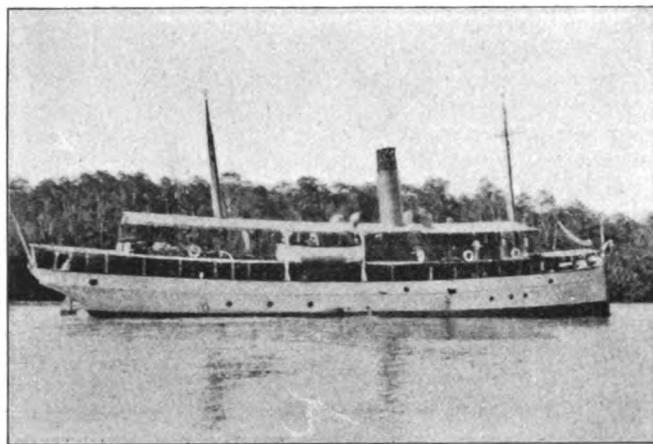
wiring on all of these boats is bad. The present chief of bureau has called the attention of the inspector at Shanghai to these defects with the hope that improvement will be made on the boats building.

#### CUTTERS BUILT AT URAGA.

"At the beginning of the year there were being built for the bureau by the Uruga Dock Co. of Japan, five twin-screw cut-



BALABAC.



MASBATE.

#### U. S. PHILIPPINE COAST GUARD CUTTERS

\$40,000 Mexican. This vessel is the largest of the seagoing launches and measures, over all, 110 ft., is 23 ft. wide, and 10 ft. deep.

"The Rover was originally known as the Chit Kong. She was bought from Leung Mok Son for \$27,000 Mexican. She was built at Hongkong in 1900 and is 99 ft. long, 17 ft. wide, and 9 ft. deep.

"The Scout was originally the Ching Poo. She was bought from S. W. Moore for \$31,500 Mexican. Her dimensions are about the same as those of the Rover.

"The Sentinel is a stern-wheel river boat, flat-bottomed, bought from Farnham, Boyd & Co., Shanghai, China, and sent down in pieces and set up at Aparri. She has been used on the Cagayan river. On March 17 last she was invoiced by this bureau to the constabulary department.

"At the beginning of the year there were being built by the firm of Farnham, Boyd & Co., Shanghai, China, for the coast guard bureau, ten cutters, about 148 ft. over all, 25 ft. wide, 11 ft. deep, composite hull, single screw, compound engines, 1 boiler, maximum draught 9 ft., coal capacity 75 tons, speed 10 knots. They were received at Manila on the following dates: Negros, September 13, 1902; Luzon, September 20, 1902; Polillo, November 4, 1902; Masbate, November 5, 1902; Corregidor, November 12, 1902; Busuanga, December 4, 1902; Balabac, December 11, 1902; Palawan, December 22, 1902; Basilan, January 19, 1903; Tablas, January 28, 1903. These ten vessels cost \$58,890 each, delivered in Manila bay. This includes contract price and delivery charge, \$3,000.

"There are being built for the bureau at Shanghai five more cutters similar to those already received. The contract calls for their completion by Oct. 11, 1903. The latest information indicates that the first of them will leave Shanghai Aug. 15. They have been named the Mindanao, Mindoro, Panay, Leyte, and Samar. The contract price at Shanghai for each is \$55,000, to be paid in five equal installments. On two of the boats \$33,360 each has already been paid and on the remainder \$22,240 each.

"The cutters received from Shanghai, generally speaking, have proven satisfactory, but they were sheathed with very thin copper, which will have to be entirely renewed within a comparatively short time. The windlasses of the first five boats were very poor. They had no friction brakes. The electric

ters. Of these the Romblon arrived at Manila Jan. 19, 1903, and the Marinduque April 18, 1903. The specifications called for the following dimensions: Length over all, 140 ft.; breadth, 23 ft.; maximum draught, 8 ft.; coal capacity, 75 tons, and speed, 10 knots.

"As the Romblon had been accepted by the bureau's agent at Uruga, full payment of 135,347.29 yen was made for her as per agreement. This includes contract price, delivery charge, spare gear, stores brought from Shanghai, etc.

"The Romblon was found to have an excessive draught over what was required by the specifications by from a foot to a foot and a half, and when ready for sea, with coal and water on board, she was excessively down by the head. In addition it was soon found that the material and workmanship on hull, boilers, and engine were very poor and the ship lacking in speed and sea qualities.

"After considerable correspondence the civil governor directed that the Marinduque be allowed to come to Manila, but subject to a reduction in price for failure to agree with the specifications. It was found that as far as the draught and speed were concerned the Marinduque was practically the same as the Romblon. Minor details, such as could be remedied in a short time after attention had been called to the Romblon, were improved somewhat in the Marinduque, but the workmanship and material in this boat also were very poor.

"Payments aggregating 74,378.36 yen have been made on the Marinduque. The Bohol, Cebu and Jolo still remain at Uruga, Japan, in statu quo and probably will not be accepted by the Philippine government. Upon the Bohol and Cebu 74,357.52 yen each has been paid, and on the Jolo 45,493.60 yen.

"As a guarantee fund the Uruga Dock Co. placed in the Hongkong and Shanghai Bank, Manila, a certified check for 62,000 yen, which is subject to the demand of the Philippine government.

"The cutter Mindanao arrived in Manila and was received by this bureau on August 21. This boat seems to be generally strong and substantial and can make contract speed of 10 knots and more with little trouble. Her decks are rough and knotty, however, and the painting on the vessel was poor, and the iron work in her bilges was rusty and the bilges were in a filthy condition. There were some minor defects that had to be remedied. The vessel was put into commission immediately for active service, with a crew the same in number and receiving the same salaries as on the other Shanghai cutters."

**WATERWAYS CONVENTION AT CINCINNATI**

Cincinnati, O., July 3.—About fifty delegates from river and harbor improvement organizations and from commercial organizations in different parts of the country responded to the call sent out by the Ohio Valley Improvement Association for a conference regarding the proposed national waterways convention. The conference was held at the Grand hotel June 29, 30, and developed a great deal of enthusiasm on the subject of river and harbor improvements generally. It was evident that the officers of the Ohio Valley organization, who were highly complimented for their zeal in everything pertaining to the improvement of waterways, had no thought of local gain in proposing another national meeting, as they were foremost in urging the conference to turn over to the National Rivers and Harbors Congress the work of calling the convention when it was found that the National Rivers and Harbor Congress is a permanent organization. The work of the Cincinnati conference is fully set forth in the following resolutions, which were unanimously adopted:

"That a national waterways convention, to which all trade, manufacturing, agricultural, laboring and river and harbor improvement associations, all governors of states and heads of municipalities shall be invited to send delegates, be held at the city of Washington during the early part of the next session of the Congress of the United States, for the purpose of arousing and expressing public sentiment in favor of a more liberal policy by our government for the rational improvement of the rivers and harbors of the whole country.

"That an executive committee of nine be appointed by the president of this conference to carry the foregoing resolution into effect.

"It having been brought to the notice of this conference that the National Rivers and Harbors Congress held at Baltimore, Md., Oct. 8 and 9, 1901, has preserved its organization through an executive committee empowered to convene future meetings, and

"Whereas, The objects of said National Rivers and Harbors Congress and of the convention authorized to be called by this conference are identical; therefore be it

"Resolved, That the executive committee of this conference be and it is hereby directed before proceeding further to request the president and chairman of the executive committee of said National Rivers and Harbors Congress to call convention substantially at the same time herein mentioned and at such place as may seem best, having the same general purpose herein indicated, and in the event of compliance with said request this conference pledges its earnest and hearty co-operation toward the success of such convention."

Following are the officers of the Cincinnati conference: Isaac M. Mason, St. Louis, president; Albert Bettinger, Cincinnati, vice president; James W. Wardrop, Pittsburg, secretary. Executive committee: W. B. Rodgers, Pittsburg, chairman; G. H. Anderson, Pittsburg; M. T. Bryan, Nashville; J. F. Ellison, Cincinnati; Thos. Wilkinson, Burlington, Ia.; Frank Gaienne, St. Louis; R. R. Bourland, Peoria, Ill.; John Fox, Blytheville, Ark.; and F. C. Fitten, New Harmony, Ind.

**STIRLING—A BOOK ON STEAM FOR ENGINEERS.**

Under the title "Stirling—A Book on Steam for Engineers," the Stirling Co. of Chicago has essayed something much more valuable than any of the common run of trade publications. The work is by no means of the catalogue stripe and occupies a place peculiarly its own. It is quite true that the Stirling boiler is given prominence in the pages and there are numerous halftones illustrating notable installations of this form of steam generator, but the bulk of the book contains data of general value to students of steam. The work is essentially an engineering hand-book prepared by the technical department of the Stirling Co. Evidently the aim has been to present to the operating and consulting engineer information of value relative to the economical generation of steam. Such prepara-

tion has developed original work in some phases of the subject.

A study of the Stirling boiler is given at the outset and there are chapters following on the characteristics of heat, air and water. The latter chapter containing timely suggestions for feed water purification, etc. Then comes a chapter on feed water heating; this precedes a treatment of steam, saturated and superheated, presented with many tables. Fuels have extended discussion and the utilization of waste heat, stack dimensions, flue-gas analysis, horse power, boiler trials, etc., have attention in considerable detail, and these chapters, like all their neighbors in the volume, are profusely illustrated. There is a compendious index and the variety of the tables will be best suggested by the statement that over sixty of these digests of useful computations and records are to be found here. Sufficient has been said to clearly show the scope of the publication from an engineering point of view. It is worthy of commendation as a book of reference for even more than the technical information it possesses in conveniently arranged form. The book is stoutly bound, neatly lettered in gold and has 248 8 x 10½-in. pages.

**RIVER NOTES**

The James Rees & Sons Co., Pittsburg, has closed a contract with the Arkansas River Packet Co., for the construction of a steel hull river packet to cost \$100,000. It will be named S. S. Brown, in honor of Capt. S. S. Brown of Pittsburg, the president of the company. The boat will have a steel hull and will be 228 ft. long and 44 ft. wide and will have engines with a capacity of 1,200 H. P. It will be equipped with a stern wheel and will operate between Memphis and Vicksburg. In addition to this vessel James Rees & Sons Co. are building a steel hull towboat for the Jones & Laughlin Steel Co. which will be pressed into the coal trade on the upper Monongahela. This boat will be a duplicate of the Vesta built for this company some time ago and will be named Henry Laughlin. The Laughlin will be 135 ft. long, 24 ft. wide and 4½ ft. depth of hold. James Rees & Sons Co. are also figuring on the construction of two steamers to be used in the river trade in South America.

**OBITUARY**

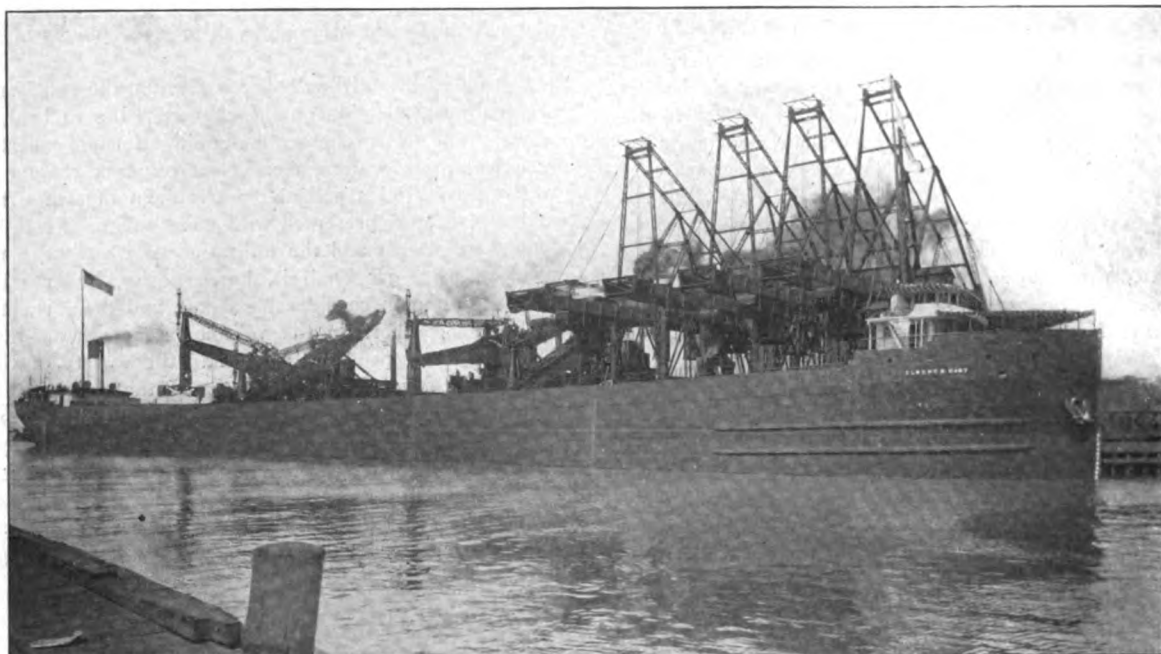
Capt. Wm. Tramper, formerly a sailor of lumber schooners on Lake Michigan, died at a hospital in Chicago last week.

Capt. Bernard Nelson of Cleveland has been appointed local inspector of hulls to succeed Capt. Henry C. Judson, resigned. Capt. Nelson has been in command of the steamer I. W. Nicholas for a number of years. Capt. Judson, who resigns on account of ill health, has been in the steamboat inspection service for about twelve years. Latterly his headquarters had been at Toledo until appointed inspector of hulls of the Cleveland district in the spring to succeed the late Capt. George DeWolf.

John F. Stevens has been appointed chief engineer of the Panama Canal Commission to succeed John F. Wallace resigned. He was until recently vice president and general manager of the Rock Island System. Lately he has been in charge of the construction of railroads in the Philippines.

The Fort Wayne Electric Works, Ft. Wayne, Ind., has just put out a very pretty little catalogue concerning the Wood Prepayment Wattmeters. This catalogue is mighty interesting and sets forth in a nutshell what prepayment wattmeters can do.

The Crane Co., Chicago, announce the removal of their general offices from No. 10 North Jefferson street to their new office building at No. 519 South Canal street. The company has five floors of open offices which give ample space for the transaction of business.



THE ELBERT H. GARY OF THE PITTSBURG STEAMSHIP CO.'S FLEET UNLOADING HER MAIDEN CARGO OF ORE AT CONNEAUT.

### SEEN AND HEARD ON THE LOOKOUT

As it requires all sorts and conditions of men to make up this world, so there is a demand for many diversities and types of craft to supply the need of an ever-increasing business on the water. In fact, a catalogue of all the types of vessels that a nation must possess in order to be regarded in the "swim," and an up-to-date member of the maritime "400," reminds one of the farmer's classification of his poultry's products as "fresh eggs," "fair eggs," "good eggs" and "eggs."

Though the world's commerce is not expected to be directly benefited by a discovery of either the north or the south pole, any nation with a maritime prestige to guard must keep in stock a craft especially adapted for detective work under decidedly disheartening conditions. Incidentally one might add that each successive failure to reach the extreme end of the earth's axis acts as a stimulus to naval architects to construct a vessel best suited for a trip through an ice-bound ocean. The "Discovery" carried Hudson to Baffin Bay in the beginning of the 16th century; the "Discovery II" cleared for the never-yet reached destination a century later, and the "Discovery III" is now offered for sale in London, after nobly having followed in the chilly wake of her old namesakes. The first mentioned vessels were originally whalers that had been advanced to the position of pole hunters, but the "Discovery III" was the first vessel ever built in England expressly for this purpose.

Though only 172 ft. in length, her beam is 33 ft., and her future owner may claim the distinction of possessing the strongest vessel of her size. Her bow, covered with steel plates, is specially constructed to withstand the impact with the ice, and the hull at that part of the ship is 11 ft. thick. Also her beams, to resist the side pressure to which ships in the Arctic are often subjected, are enormous. Bark rigged, with an auxiliary engine placed rather far aft, roomy cabins, and with lines that were designed to cause her to be lifted should the pressure of ice against her sides become unbearable, it is interesting to speculate as to her future sphere of usefulness. In this connection a French journal claims that she is peculiarly well adapted for use in the hazardous undertaking of blockade running, while others ridicule this idea on the ground that the builders sacrificed speed on the altar of strength, and speed is a necessary adjunct to the requirements of a blockade runner.

In "A Thousand Leagues Under the Sea" Jules Verne described the voyage of the Nautilus, a combination submarine yacht and torpedo boat commanded by a Captain "Nemo." The latter, besides being able to monopolize the pearl industry, derived an enormous income from recovering treasures from sunken ships. For instance, it was known that in 1702 a fleet of Spanish ships was expected to arrive in Cadiz with a cargo of gold and silver, but seeing English privateers ready to relieve them of their freight they proceeded to the Bay of Vigo, where they subsequently successfully acted the part of dog in the manger by being scuttled. It was, then, on the bottom of this Bay of Vigo that Captain Nemo had his principal safety deposit vault; but with the disappearance of the Nautilus and the death of her captain the combination was lost. At last, however, there is a prospect of recovering the treasure by means of an Italian's invention known as the "hydroscope," or "water-telescope."

In a French marine journal the hydroscope is said to have enabled the inventor to see the high poops of the ancient gold drovers as they protude from the sand at the bottom of Vigo Bay. But as the Spanish government and the inventor will share the treasure that lately became visible other nations are chiefly interested in the invention with regard to the use to which it may be put on their own men of war and merchant vessels. In fact, a veritable all-seeing eye inserted in the bottom of ocean going craft has been predicted to be a possibility in the near future. In the meantime, the value of the treasure sunk in this bay years ago is known; and after deducting from this sum the amount recovered by the useful invention the world can at last form an estimate of the cost of operating the Nautilus.

Orders have been issued by the navy department for the armored cruiser California to be ready to test the new steel floating dock built by the Maryland Steel Co. at Sparrow's Point, Md., for the use of the navy department in the Philippines.

The cruiser Charleston underwent her speed trial last week and reached a speed of 22.03 knots or three one-hundredths of a knot in excess of contract requirements. The trial was satisfactory in every way and about as severe as any ever given to a naval vessel. The Charleston was built by the Newport News Ship Building & Dry Dock Co., Newport News, Va.



## WHERE SHIP MASTS COME FROM

Portland, Ore., July 5.—(Special Correspondence).—The great impetus which has of late been imparted to fir lumbering operations in the Northwest is attributed in great measure to the growing realization on the part of ship builders not only throughout the United States but abroad that there is nothing to compare with the product of the north Pacific coast forests as material for masts and rigging in general. The approaching exhaustion of several other sources of supply has, in added measure, turned attention to the resources of the Columbia river basin and the Puget Sound country.

The Northwestern forests contain not less than ninety different species of trees and shrubs—everything in fact save the most valuable cabinet woods—but their most highly-prized products are the red, yellow and silver firs. The red and yellow firs rival pine in lightness and oak in strength and durability. They have nearly twice the strength, under pressure of eastern oaks and nearly three times that of eastern pine, which will explain in some degree why vessel builders on the Atlantic coast are turning to the Pacific northwest for this class of raw material.

The firs grow very straight and their great height—300 ft. being not un-

usual—is another qualification which peculiarly fits them for use as masts. Government officials estimate that at the present rate of cut the timber supply of the northwest will suffice for more than one hundred years and inasmuch as nearly one-

sixth of the total amount of standing merchantable timber in the United States is to be found in Oregon alone of which more than 60 per cent is fir, it may be realized that ship builders have no ground for uneasiness regarding the source of supply.

The logging methods employed in the fir forests of the northwest are radically different from those followed in the east, or indeed in any other part of the world. The unique practice is necessitated

in a measure by the size and weight of the trees but in even greater degree because of the fact that the northwestern lumberman is denied the assistance afforded by snow and ice in his transportation operations. In the lumber regions of New

York and New England and in Michigan and elsewhere in the middle west it is customary to fell the trees in the autumn or early winter and to transport the logs over ice roads to the banks of streams which they are floated by the spring freshets.

In the northwest, however, although the latitude corresponds to the extreme northern part of Maine, snow and ice are practically unknown and the lumbermen are compelled to rely upon logging by steam.



CUTTING THE TIMBER.



LOADING FUTURE MASTS UPON CARS.

The trees may be cut down at almost any season of the year and are dragged from the depths of the forest by means of wire rope cableways operated by engines which resemble pile-driving engines. The cables employed are seldom much less than one inch in thickness, great strength being necessitated by reason of the fact that the trees are drawn along pathways which have had no preparation other than the mere clearing away of the debris.

A second engine draws the logs along a "skid" road to the point where they are placed aboard the railroad cars which carry them to the mills. Great care is needed in skidding not to rub or tear the bark from valuable trees, or to break down the young growth, inasmuch as a vast amount of harm may be done in this manner in a short time.

Various methods are employed in placing the long "sticks" aboard railroad trucks, but the most common plan involves the rolling of the logs up an incline rudely constructed from other logs to the level of the trucks, several horses and a gang of about a dozen men furnishing the motive force for this work. The great length of many of the firs designed for use as masts makes their transportation by rail something of a problem, particularly by reason of the fact that a majority of the western logging roads have sharp curves. There are about 450 saw mills in the state of Oregon alone and a large proportion of them are equipped for handling ship timber. Inasmuch as single sticks from 125 to 150 ft. in length are common, all the more pretentious plants have facilities for handling material of such dimensions.

### A NEW COAL-LOADING PLANT AT LORAIN

By W. M. Ray, Assistant Engineer Baltimore & Ohio Railway

In April, 1902, the Baltimore & Ohio Railway, operating the Cleveland, Lorain & Wheeling Ry., acquired a tract of forty-two acres of land on the left bank of Black river, adjoining its yards at Lorain. The company has had at Lorain since 1899 a McMyler side-pump car for transfer of shipments of bituminous coal from cars to vessels, and this machine has given satisfaction, having worked up to a capacity of 800 tons per hour. On account of increasing lake business and a desire to have a secondary plant for fueling vessels and to supplement the old machine, in case of a breakdown, it was decided to develop a new dock and plant on the new property.

The topography of the tract acquired comprised the usual bluff and swamp to be found at southern lake ports. The bluff forms the bank of the river for about 1,500 ft. from our tracks, presenting 700 ft. of almost straight bank, the crest of which is an elevation of 35 to 40 ft. above the river, with a slope of 1 to 1 or less to the water's edge. Drillings showed the bank to consist of a hard clay resting on disintegrated shale at about 4 ft. above the water, which hardened to solid shale at or slightly below the water level.

A preliminary study for a pocket dock was prepared, which proposed a framed structure to carry tracks over storage pockets at the water edge, to discharge by gravity through inclined spouts into the vessel hatch. This plan was abandoned on account of the extreme height required, with consequent cost of pockets and trestle approach, providing only a temporary structure at best. To discharge into a modern vessel of 54-ft. beam at 20 ft. above water level requires an elevation of the trunnion of the chute of 45 ft., which elevates the tracks to 65 or 70 ft. above the water.

These considerations led to the adoption of a plan comprising:

1. A pocket capacity to exceed the largest coal car.
2. A conveyor from a boat at the foot of the pocket to a point on the dock front at the height of the trunnion for a gravity chute to the vessel hatch; the conveyor to be of a capacity to handle the coal as fast as it can be discharged from cars dumped one after the other into the pocket.

3. A gravity chute with telescoping end, such as is in use on the car unloaders, with the necessary power and rig for manipulation.

The dock site presented some peculiar features, which were taken advantage of in construction. The shale bottom prevented the driving of piles, and to excavate shale at the foot of the bluff to a depth of 22 ft. below water for a crib foundation seemed unnecessary. As the dock was to serve only as a landing stage, plans were drawn for a crib to be bedded on the shale just below water line, and required a channel to be cut in the shale along the dock front to the proposed depth of the river, so that the bench on which the crib was built would not be disturbed by dredging. If necessary, this channelled shale face was to be protected by 6-in. sheet piling secured to the crib.

Proposals on these plans were solicited in 1902, but the figures submitted were high, and no contractor was found who would undertake to channel shale to a depth of 22 ft. under water. The matter was allowed to go over until the summer of 1903.

On June 25, 1903, the Standard Contracting Co. of Cleveland was awarded the contract for the dock and dredging, on their proposition to substitute a row of holes drilled as close as possible for the channel in the shale. Work was begun in September, but little progress was made until late in the fall. A high stage of water prevailing in Black river through the winter of 1903 added much to the difficulty of clearing away the bed for the crib to the proposed depth, and the contractor resorted to the use of a cofferdam, enclosing about 100 ft. of the site at a time and lowering the water sufficiently by pumping to permit clearing of the site by hand. The crib was completed by April and the stone filling was in place May, 1904. As soon as the crib was in shape to afford a sufficient support for the machine, a drill was landed from the contractor's drill boat, a scow carrying boiler and air compressor being kept alongside to furnish power, and the drilling of the channel began. With a drill 4 in. in diameter it was found impracticable to drill the holes closer than 10 in. c. to c. The 700 lineal feet of drilling was finished in about 30 working days. The shale dredging was done by a dipper dredge in the usual manner after having been shattered by blasting. There were no indications of disturbance of the bench back of the row of holes. Dredging was completed June 16, 1904. Prices had been obtained on the different parts of the coal-handling plant, but it was desired to have one concern responsible for the assembling and erection of the machinery, and on Feb. 19, 1904, a contract was closed with the McMyler Mfg. Co. of Cleveland for the following plant: A steel-lined pocket, or hopper, of 60 tons capacity; a conveyor 5 ft. wide with overlapping buckets, by the Link Belt Co. of Chicago, to have a capacity of 650 tons per hour; a wooden tower at dock to support outer end of conveyor; an inclined chute with telescoping end; an 80 H. P. horizontal boiler of the locomotive type; an Ideal engine, 11 x 10, r. p. m., by A. L. Ide & Sons, Springfield, Ill., 35 H. P.

The machinery was erected and ready to run on July 7, but some defects were developed which caused delays, so that the first running test was made on Aug. 2. It was found necessary to provide an adjustable door at the foot of the pocket. An opening of proper size to load the conveyor with lump coal would overload it when the machine was handling slack coal. The power plant was adequate, but the friction and transmission gears furnished needed to be materially strengthened to carry the loads.

Unfortunately for a satisfactory test of the machine, it was completed at a time when the coal shipments began to fall off and the business could be cared for at the other dock. No ten-hour test has been made as yet, and the gravity yard has not been supplied with cars sufficient for a steady run. However, in a period of forty minutes ten 50-ton cars were dumped



and the coal handled at the rate of 750 tons per hour. A car can be dumped and pocket cleared in three minutes.

In connection with this plant, a storage yard with a capacity of eighty cars was built, from which the loaded cars are moved by locomotives to three feed tracks holding thirty-nine cars, which pass by gravity over the pocket and are returned by kick-back along the front of the bluff to two pocket tracks which hold thirty-six empties. The Ohio Engineering Co. of Elyria was contractor for the grading. Plans for this improvement were prepared by W. B. Hanlon, district engineer, under J. M. Graham, chief engineer of the Baltimore & Ohio railroad, the writer being assistant engineer in charge of construction. The drawings for assembling the machinery were made by F. W. Lovell, engineer for the McMyler Mfg. Co. The machine is operated with ten men at a cost of \$560 per month, while the car dump is operated with eleven men at a cost of \$750 per month, both exclusive of engine service.

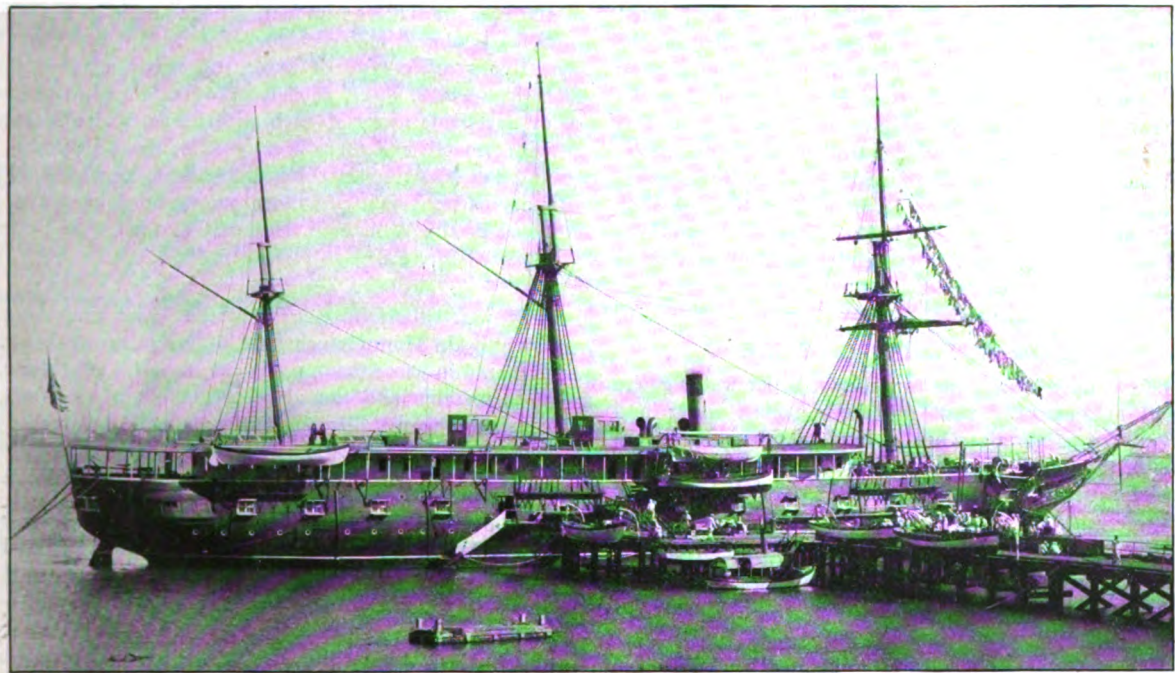
### TRAINING SHIP PENSACOLA

Very few American war vessels now afloat, that took an active part in the Civil War have had a longer and more glorious history than the old steam sloop of war, Pensacola.

Florida live oak hull, had not yet given place to steel. She was one of the five first class screw sloops of war, the construction of which was authorized by the Act of March 3, 1857.

Her sister ships, the Hartford, Brooklyn, Lancaster and Richmond, were, like herself, favorites in the old navy, and assignment to any of them was an appreciated honor. The Hartford was Farragut's flagship at New Orleans, and Mobile, and the Brooklyn, Richmond and Pensacola, were in his squadron, and participated in his great victories. They were all of somewhat over 2,000 tons, about 250 ft. in length, and some 43 ft. beam, drawing about 16 ft., when ready for sea; they had large sail area and possessed many of the qualities that made the old clipper ships famous in the mercantile marine.

The Pensacola was built at the Pensacola Navy Yard, Florida, from designs of John Lenthall, a famous naval constructor, and the lines are fine and beautiful. She was completed just before the breaking out of the Civil War, and sailed to Washington to be fitted out. About August, 1861, she was put in commission with the veteran Capt. Henry W. Morris as commander, and Lieut. F. A. Roe, now rear-admiral, as executive officer.



THE OLD TRAINING SHIP PENSACOLA.

This craft lies moored at the dock at the island of Yerba Buena in San Francisco Bay, and has long been used as a naval training vessel for boys. The island of Yerba Buena belongs to the United States, and on it are located a number of large buildings that are used as a naval training school. At a glance at the old Pensacola, the expert eye identifies the war craft as one belonging to a past period of marine architecture. But, for all that, the vessel has a handsome appearance, and the sight of this veteran craft of the seas, instantly revives memories in the minds of older observers, of the great Civil War. The history of the Pensacola is intimately interwoven with the achievements of Commodore Farragut, the hero of New Orleans and Mobile Bay.

The name *Pensacola* is an Indian (Seminole) word, and literally signifies "bay of plenty." Evidently, this significance was known to the builders of the vessel, as her gangway headboards were carved with cornucopias—"horns of plenty."

The Pensacola is a type of the fast ships of the old navy, when sails were still used as auxiliary to steam, and the

While preparing for sea, Lieut. Roe was ordered, temporarily, in great haste, in consequence of the defeat at Bull Run, to occupy with 500 seamen, Fort Ellsworth, near Alexandria, and so occupied it on the left of McClellan's line, until the Army of the Potomac went down to the peninsula, when he returned to his ship. The passage of the Pensacola down the Potomac was an exciting and somewhat memorable one. The river was blockaded for nine miles by a succession of rebel forts, and batteries on the Virginia side, the officers of which were under strict orders not to permit the passage of any vessel.

President Lincoln and his cabinet were honored guests on the ship until the batteries were reached, when they were taken off and returned to Washington, while the Pensacola pursued her course through nine miles of unrelenting fire, down the river to Hampton Roads without serious injury. She accompanied the Hartford, with Flag Officer Farragut to the West Gulf blockading squadron, arriving off the Mississippi, March 7, 1862, and participated in the blockade of the



coast and the long preparations for the coming battle. The old Pensacola took an active part in the battle of New Orleans. She was hotly engaged during her entire passage of the forts and the enemy's boats for an hour and a half, firing chiefly with grape and cannister.

Capt. Morris and Lieut. Roe received strong commendation from Commodore Farragut in his official report, and the latter was recommended for promotion for his skill and bravery in action. The Pensacola also took a very active part in the attack at Vicksburg and other engagements in connection with Farragut's fleet. She was badly damaged, and after being sent to the docks for necessary repairs, remained on duty in the gulf for the next two years, sometimes serving as a flagship of the squadron.

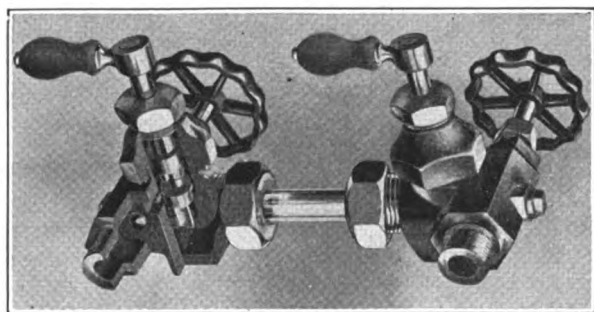
After the war, the Pensacola went to the yards and, thoroughly overhauled, repaired and refitted sailed in August, 1865, for the Pacific ocean, under command of Capt. John L. Worden, who will be remembered as the gallant lieutenant who was in command of the Monitor in her famous encounter with the Merrimac in Hampton Roads.

She remained on the Pacific Station, usually as its flagship, until the latter part of 1883, when she began her homeward voyage under the command of the present Rear-Admiral Henry Erben.

The Pensacola was again thoroughly repaired and fitted out at the Norfolk Navy Yard for duty as the flagship of the European squadron. She was at that time commanded by Capt. George Dewey—"the hero of Manila"—and flew the flag of Rear-Admiral Franklin. Upon her arrival from European waters, the Pensacola made a trip to Africa on special duty, and then came again to the Pacific station. Years after, the old war-scarred veteran was fitted up as a training ship, and placed at Yerba Buena island where she has been ever since. The Pensacola bids fair to render efficient service in that capacity for years to come.

### SHALLOW AUTOMATIC GAUGE

Many efforts have been made to devise a boiler water gauge which will automatically shut off the escaping water and steam when the gauge glass breaks, and of the many inventions having this object in view, the shallow valve seems to be the most satisfactory, in that it fulfils every requirement



SHALLOW AUTOMATIC GAUGE.

and at the same time eliminates the defects that exist in other valves designed for this work. It has been conceded that if a perfect automatic water gauge could be devised, its use on boilers and high pressure tanks would be morally obligatory and should be made compulsory by law, for the obvious reason that one fruitful source of accidents, more or less serious, would thus be removed; that such a law has not already been passed is doubtless due to the fact that heretofore no reliable and efficient instrument was available.

The shallow gauge, like most good things, is exceedingly simple in principle and in construction; a cursory examination of the accompanying cut will be sufficient to convey a clear idea of its operation and explain why this valve has been ap-

proved and adopted by every engineer to whom it has been shown. The automatic valve is not subjected to wear excepting only when it is closed through the breaking of a glass, and as this occurs only at widely separated intervals, there can be no appreciable wear for many years. The whole valve is constructed of brass, and the design of the passages and working parts is such that no trouble is ever experienced from the collecting of sediment or scale and the consequent sticking of the valve. The action of the shallow gauge when a glass breaks is so instantaneous that in practically every case some water still remains in the bottom of the broken glass after the valve is closed. A new glass is inserted at once and without any preliminaries, except the closing of the hand valve, and as soon as it is in place, the automatic valves are brought into position for further service by the simple turning over once of the two automatic handles.

In connection with marine boilers in which very high steam pressures are carried and about which the fire room space is very limited, the advantages of the shallow automatic gauges are even greater than in the case of stationary boilers, the danger from flying glass and hot water and the filling of the boiler room with steam being absolutely eliminated.

The advantages of the shallow valve, in connection with pressure tanks for elevator systems, etc., is as obvious as in the case of boilers; in fact, an automatic gauge on elevator tanks is almost indispensable.

Every other type of automatic valve involves the use of balls, springs, discs, rubber, or other complicated mechanism or unreliable material, each with its particular fault and some with several, and there is no user of these apparatus who has not had his troubles come from them, generally at the most inopportune times. Shallow automatic gauges are manufactured by the William S. Haines Co., 122 South Fourth street, Philadelphia, Pa.

Smooth-on elastic cement is the latest preparation of the Smooth-On Manufacturing Co. This is an iron elastic cement prepared in paste form, ready for use. Its advantages are that it is metallic and can also be applied to hot iron, the heat causing it to metallize instantly makes it invaluable for stopping leaks. Their new smooth-on elastic cement instruction book will be sent free of charge to any one interested.

The Westinghouse Electric & Manufacturing Co., Pittsburg, Pa., has just issued a neat little booklet devoted to their Type B Westinghouse Integrating Wattmeters. It will be sent to those interested upon request.

The Philadelphia Ship Repair Co. has just begun operations in Philadelphia as a floating dry dock company. This company was established by F. J. McDonald, formerly connected with the Neafe & Levy Ship & Engine Building Co. At the present time they have only one dry dock, which seems to be quite busy. This dock is located at the foot of Mifflin street.

The Fabric Fire Hose Co., which has for years had its New York office at 68 Murray street, has just moved to larger and better quarters on the ground floor of the Graham building, Duane street, corner of Church.

Mr. W. A. Stadelman, eastern agent of the Wellman-Seaver-Morgan Co., and who has been in charge of the eastern office at No. 42 Broadway, New York city, has been appointed general sales agent of the same company with headquarters at Cleveland, taking effect July 1.

Mr. Fred Stadelman has been appointed assistant manager of the New York office of the Wellman-Seaver-Morgan Co.

Mr. Harry V. Croll, M. E., for the past eight years with the E. P. Allis Co. and their successors, Allis-Chalmers Co. of Chicago, has resigned and accepted a position with the Wellman-Seaver-Morgan Co. of Cleveland.





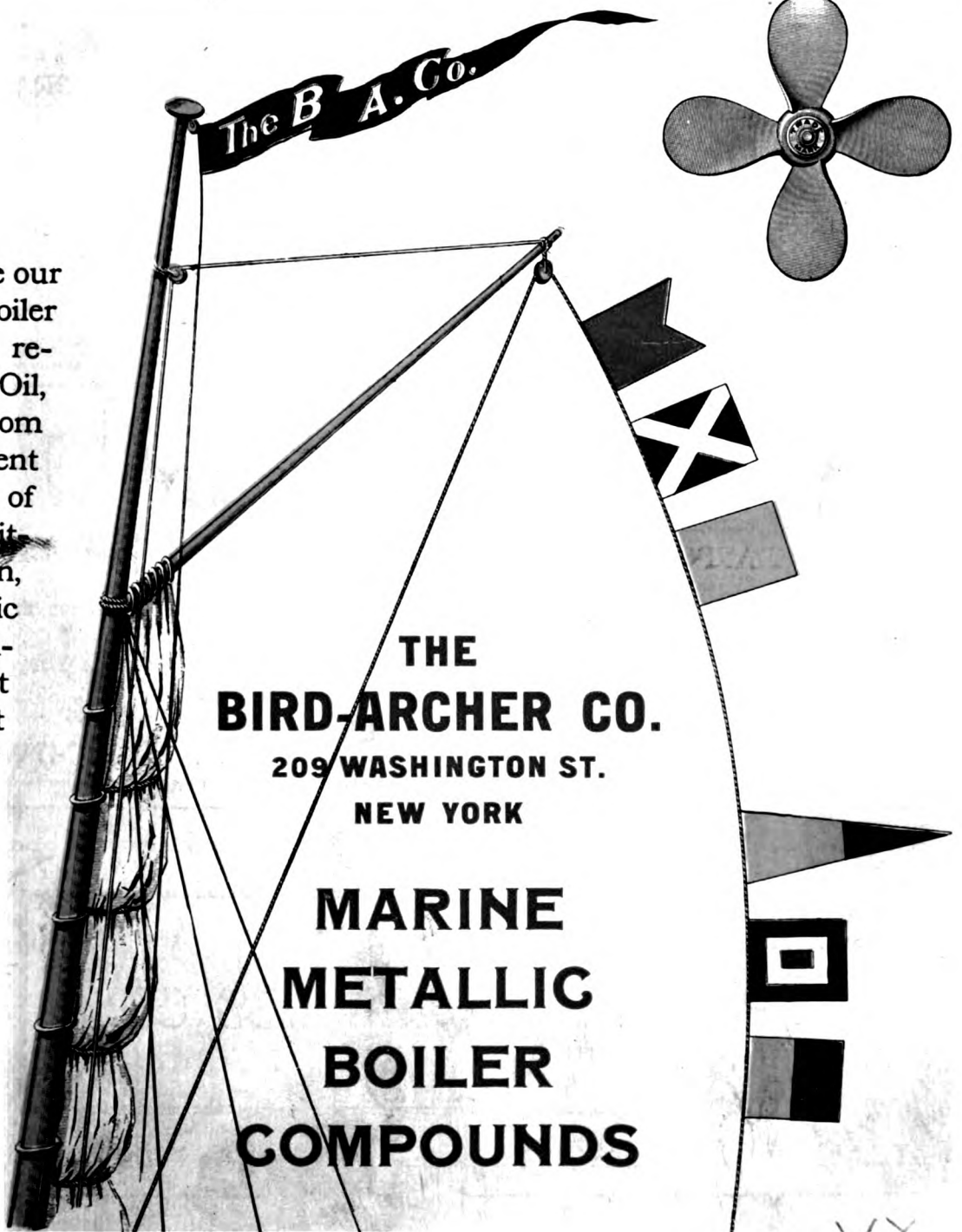
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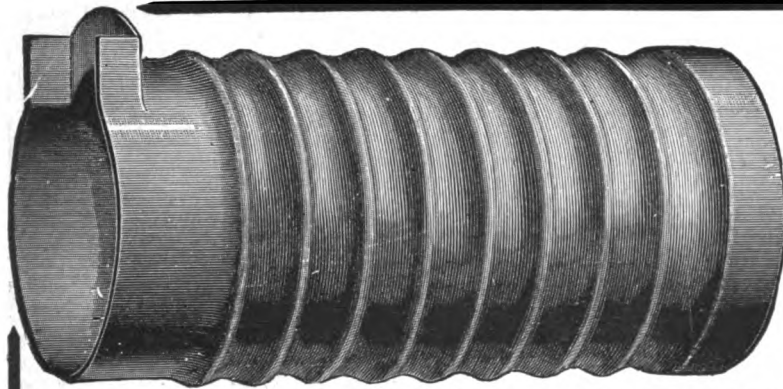
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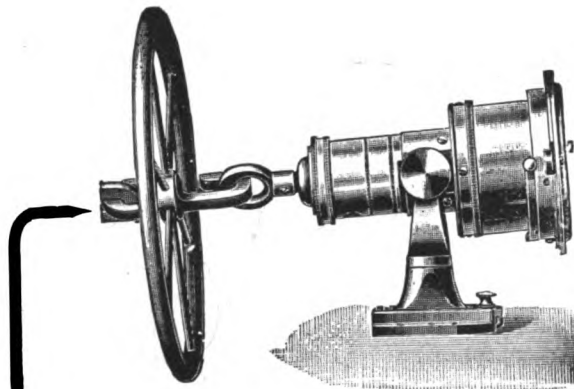
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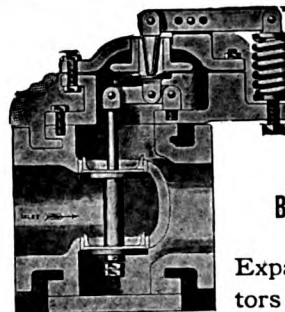
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"Otis" Fire Box Plates a Specialty.

**STEEL CASTINGS FROM 100 TO 100,000 LBS.**

**OTIS STEEL CO., Ltd.,** Head Office and Works, **CLEVELAND, O.**

New York: Thorpe, Platt & Co., 97 Cedar St.  
Montreal: Homer Taylor, 183 St. James St.

AGENCIES.

St. Louis: C. A. Thompson, 516 N. Third St  
San Francisco: John Woodlock, 154-156 First St.  
Detroit: George W. House, Union Trust Building.





## The American Ship Building Company

MAIN OFFICE CLEVELAND, OHIO

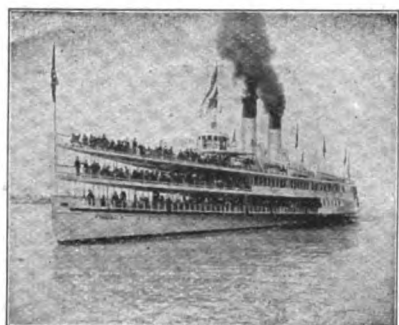
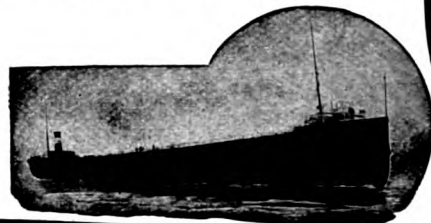
Marine and  
Stationary Engines

### STEEL SHIPS

Boilers and  
Auxiliary Machinery

Sole Agents for the Lakes for the Ellis & Eaves Induced Draft System, as applied to boilers, giving increased power and great economy.

WORKS AT CLEVELAND AND LORAIN.



## Detroit Ship Building Company

### SHIP AND ENGINE BUILDERS

Sole Owners for the Lakes and Atlantic Coast of the HOWDEN HOT DRAFT SYSTEM as applied to Boilers, giving increased power and great economy.

Steel Ship Yard located at Wyandotte, Michigan  
Wooden Ship Yards and Dry Docks, Foot of Orleans Street, and Foot of Clark Ave., Detroit, Mich.

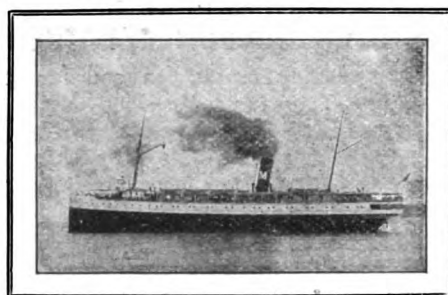
Alexander McVittie, President and Manager  
William C. McMillan, Vice President  
M. E. Farr, Secretary and Treasurer  
Charles B. Calder, General Superintendent  
Frank E. Kirby, Consulting Engineer

WM. L. BROWN, Pres.  
J. C. WALLACE, Vice-Pres.

R. C. WETMORE, Sec'y and Treas.  
O. W. FREY, Ass't. Treas.

ALFRED G. SMITH, Gen'l Supt.

## Chicago Ship Building Company

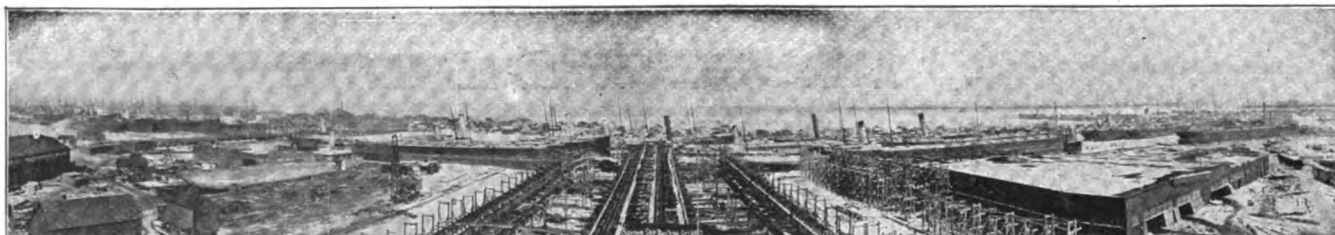


### STEEL SHIPS

*Passenger or Freight*

ANY SIZE

Yards, Dry Docks and Repair  
Shops at South Chicago, Ill.



## The Superior Ship Building Company

### SHIP AND ENGINE BUILDERS

*Dry Docks and Repairs of all kinds*

Large stock of material always  
on hand for Repairing Wooden  
and Metal Ships.

Repairing promptly attended  
to, Night or Day.

WEST SUPERIOR

WISCONSIN





No. 70.

## CRANE NAVY VALVES

UNION BONNET

GLOBE, ANGLE, CROSS AND CHECK

REGRINDING

FOR 175 LBS. STEAM PRESSURE TESTED TO 250 LBS. HYDRAULIC. CAN BE REGROUND WITHOUT DETACHING FROM PIPE. MAY BE PACKED WHILE VALVE IS OPEN AND PRESSURE ON. ARE EXTENSIVELY USED ON STEAM VESSELS WHERE A PERFECTLY RELIABLE VALVE IS REQUIRED.

NEW YORK  
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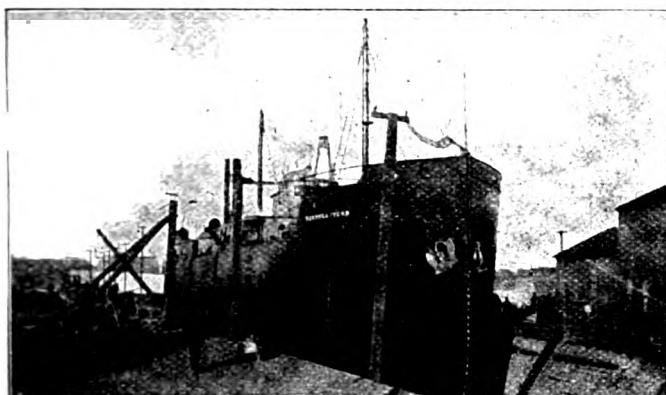
WRITE FOR COMPLETE POCKET CATALOGUE

## CRANE CO.

CHICAGO

ESTABLISHED 1855

MINNEAPOLIS  
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LOS ANGELES  
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BIRMINGHAM  
SEATTLE  
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MEMPHIS  
DALLAS



## Milwaukee Dry Dock Company

MILWAUKEE

WISCONSIN

### SHIP REPAIRS OF ALL KINDS

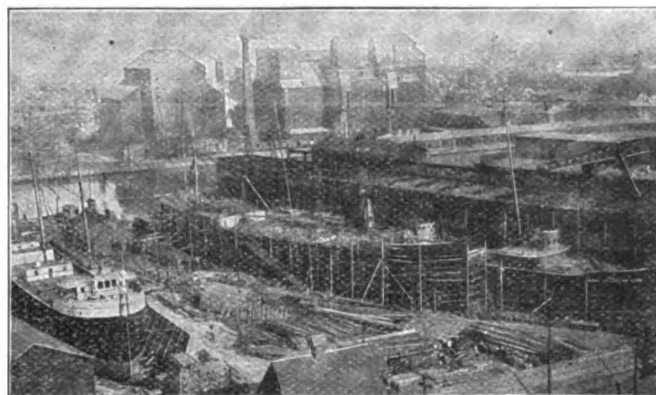
We have two ship yards offering every facility for the repair of both steel and wooden vessels. South Yard Dock is 450 ft. long on keel blocks; 460 ft. over all; 60 ft. width of gate and 16 ft. over sill. West Yard Dock is 312 ft. on keel blocks; 45 ft. width of gate and 12 ft. over sill. Rudder pit in each dock.

Electric lights for night work.

MAIN OFFICE AT SOUTH YARD

Foot of Washington Street

Telephone Main 3



## The Buffalo Dry Dock Company

BUFFALO

NEW YORK

Operating four Docks, Sixty-Ton Shear Legs, and in every way equipped with modern plant for the building and economical repairs of **STEEL AND WOODEN SHIPS.**

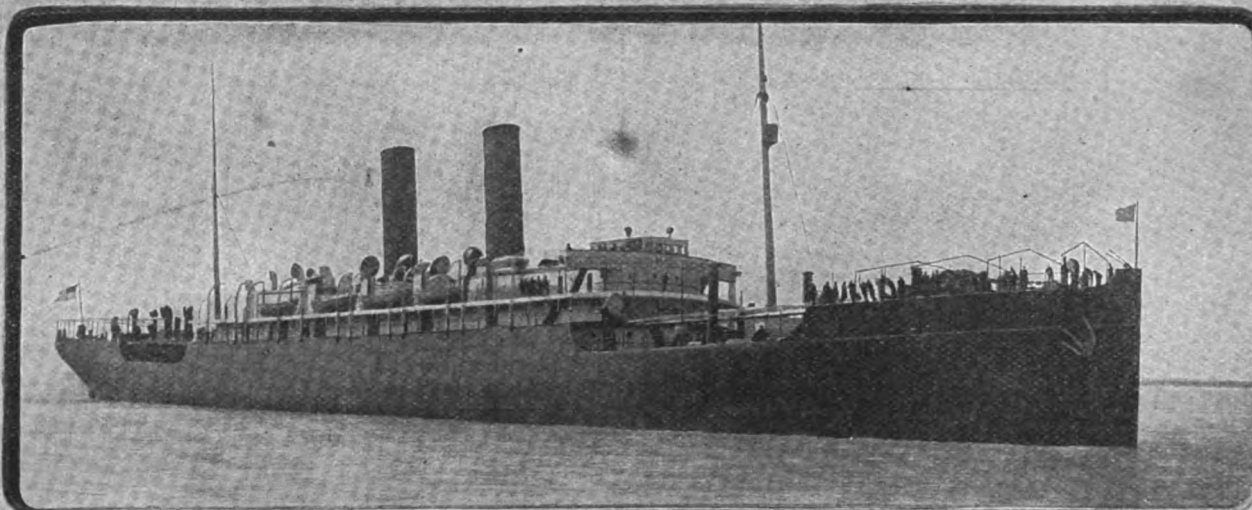
EDWARD SMITH, President ADAM STEEL, Superintendent  
WILLIAM KNIGHT, Asst. Sec'y and Treas.

Office Telephone, 515 Seneca. President's Office Telephone, 2329 Seneca.  
President's Residence Telephone, 209 Bryant. Asst. Sec'y's Telephone, 324 North.  
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# OUR SHIPYARD

WITH ITS ACCOMPANYING DRY DOCKS  
AND WORKS, WAS CAREFULLY DESIGNED,  
EQUIPPED AND COMPLETED FOR THE



CONSTRUCTION AND REPAIRING  
IN EVERY DETAIL OF

BATTLE SHIPS · ARMORED CRUISERS ·  
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NEWPORT NEWS SHIPBUILDING & DRY DOCK CO.  
1 BROADWAY NEW YORK — NEWPORT NEWS, VA.

After four years of investigation, the Boller Committee appointed by the British Admiralty have unanimously declared that water tube boilers are more suitable for Naval purposes than cylindrical, and have again placed THE BABCOCK & WILCOX at the head of all types.

## THE BABCOCK & WILCOX CO.

NEW YORK and LONDON

WORKS:

Bayonne, N. J., U. S. A.  
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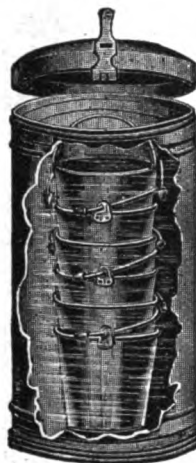
### SAFETY FIRE BUCKET TANK



An airtight Tank, containing a supply of chemical solution and Six Fire Buckets with self-raising handles.

THIS SOLUTION

REQUIRES NO  
ATTENTION—  
WILL NOT  
EVAPORATE—  
FOUL—FREEZE



Always Ready for Use

Now in use by  
Hamburg-American Line—  
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Ferry Boats of

Penn. R. R. S. I. R. T. Co.  
Erie R. R. D. L. & W. R. R.  
C. R. R. of N. J. N. Y. C. & H. R. R. R.

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**Safety Fire Extinguisher Co.**

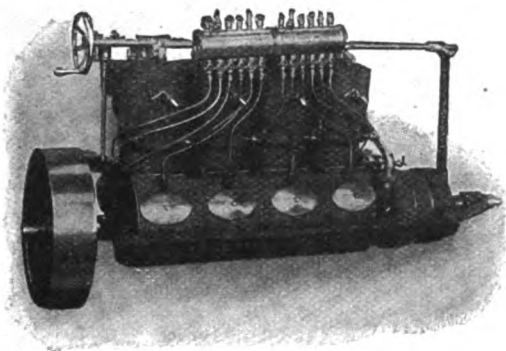
SPALDING BUILDING

29-31-33 West 42d Street

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### TRUSCOTT

THE DEPENDABLE MARINE MOTOR



Made to withstand the most severe and continuous service. A practical design characterized by the accessibility, compactness and simple ignition, gas producing and oiling features. Perfect control.

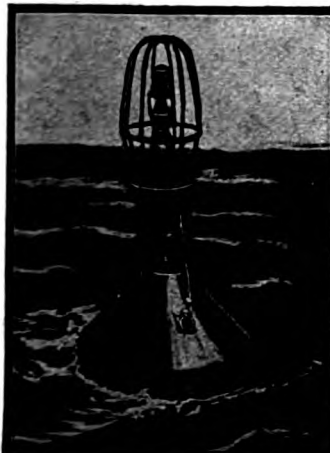
Four cycle type two and four cylinders, from 8 to 65 H. P. Smaller sizes of the two cycle type.

Catalogue and copy of The Launch for the asking.

Department 46.

**Truscott Boat Mfg. Co.**

ST. JOSEPH, MICHIGAN.



### Pintsch Gas Lighted Buoys

BURN CONTINUOUSLY

FROM 80 TO 365 DAYS AND NIGHTS WITHOUT ATTENTION AND CAN BE SEEN AT A DISTANCE OF SIX MILES.

**Brilliant & Steady Illumination. Economical & Reliable in Operation.**

Adopted by the English, German, French, Russian and United States Light House Departments for Channel and Harbor Lighting; over 1800 gas buoys and gas beacons in service.

Controlled by the

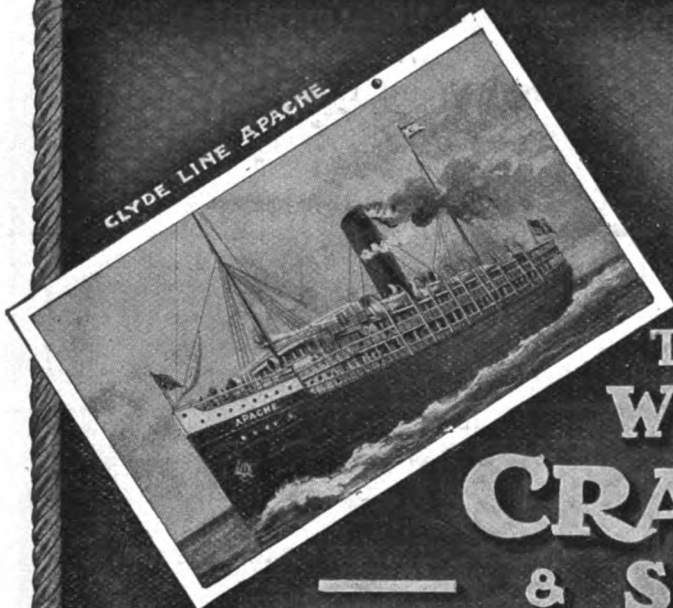
**SAFETY CAR HEATING & LIGHTING COMPANY**

160 Broadway,

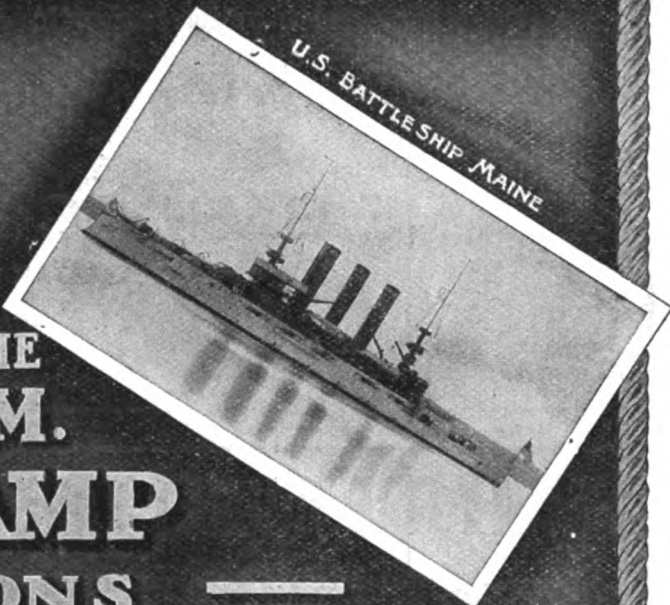
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CLYDE LINE APACHE



U.S. BATTLESHIP MAINE



THE  
WM.  
**CRAMP**  
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**SHIP & ENGINE BUILDING Co.**  
ESTABLISHED 1830

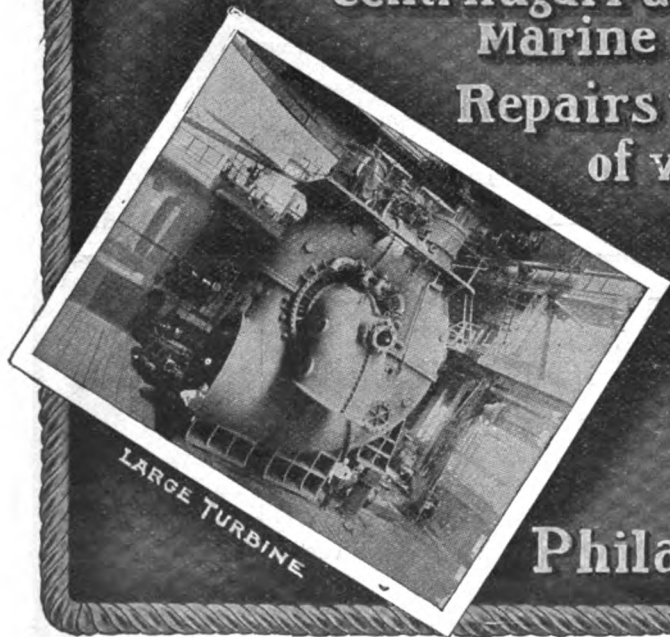
**I.P. MORRIS COMPANY**  
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**KENSINGTON SHIPYARD Co**

**WARSHIPS AND MERCHANT STEAMERS**  
Pumping, Blowing and Hoisting Engines, Dry Docks  
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Marine Railway.

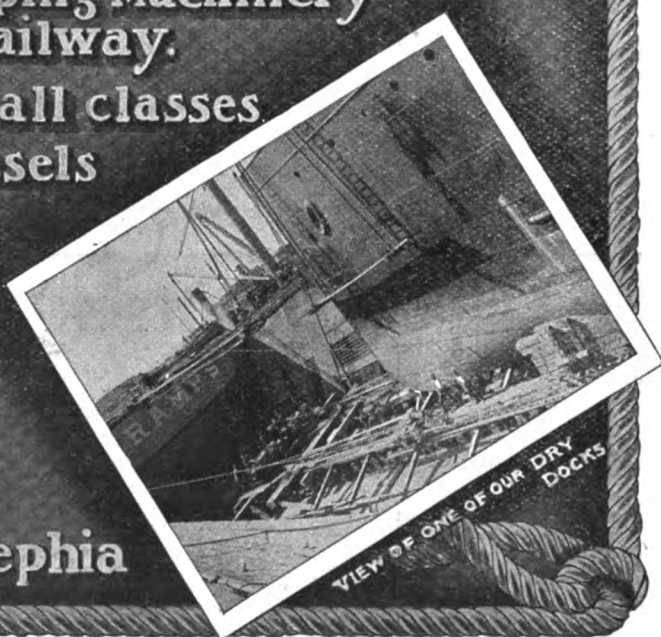
Repairs to all classes  
of vessels

LARGE TURBINE



**Philadelphia**

VIEW OF ONE OF OUR DRY DOCKS





**CLEAN BOILERS**

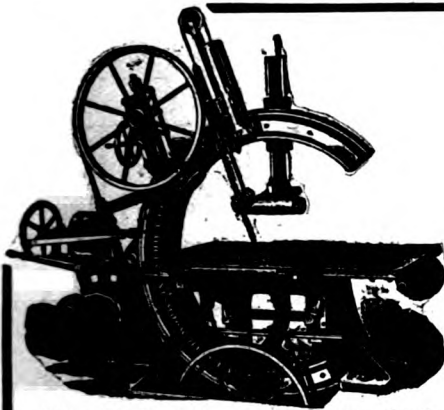
**Dearborn Water Treatment** made to suit the case. Takes off the scale, keeps it off, stops corrosion and foaming. Send gallon of water for analysis.

**DEARBORN DRUG & CHEMICAL WORKS**

**G. R. CARR,**  
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16 BRANCH OFFICES IN THE U. S.

**227-234 Postal Telegraph Bldg., CHICAGO.**



Established 1869.

Incorporated 1896.

**Atlantic Works Incorporated**

Successors to Berry & Orton Company,

Manufacturers of

**MACHINERY FOR WORKING WOOD**

**ALSO BAND SAW BLADES**

For use in Ship Yards, Car Shops, Railroad Shops.

HOLLOW CHISEL MORTISERS.

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Estimates Furnished—Send for Catalogue.

Adjustable Bevel Band Saw—Will bevel both ways at 45 degrees. Power Movement to change angles. Power feed in three directions.

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**THE STANLEY B. SMITH COAL AND DOCK CO.,**  
TOLEDO HARBOR, TOLEDO, OHIO.

1,800 Feet of Dock.

6 McMyler Derricks.

Capacity 3,000 Tons Daily.

**Fuel Lighters.** —"KANAWHA."  
—"PENNSYLVANIA."  
—"HOCKING."

**Docks.** —PENNSYLVANIA R. R.  
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**SMITH'S COAL DOCK, Detroit River, DETROIT, MICH.**

12 Pockets.

Platform.

Low Dock.

Operated by STANLEY B. SMITH & CO.

MARINE SUPPLY COMPANY—STORE AND ICE HOUSE ON DOCK.

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GENERAL OFFICE, LAKE DEPARTMENT, PERRY-PAYNE BUILDING, CLEVELAND, OHIO

**Steamboat Fueling Facilities at Various Points on the Great Lakes**

CLEVELAND HARBOR { 4 Car Dumpers.  
3 Lighters.

FAIRPORT HARBOR { 1 Car Dumper.  
1 Lighter.

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Fuel Pockets.

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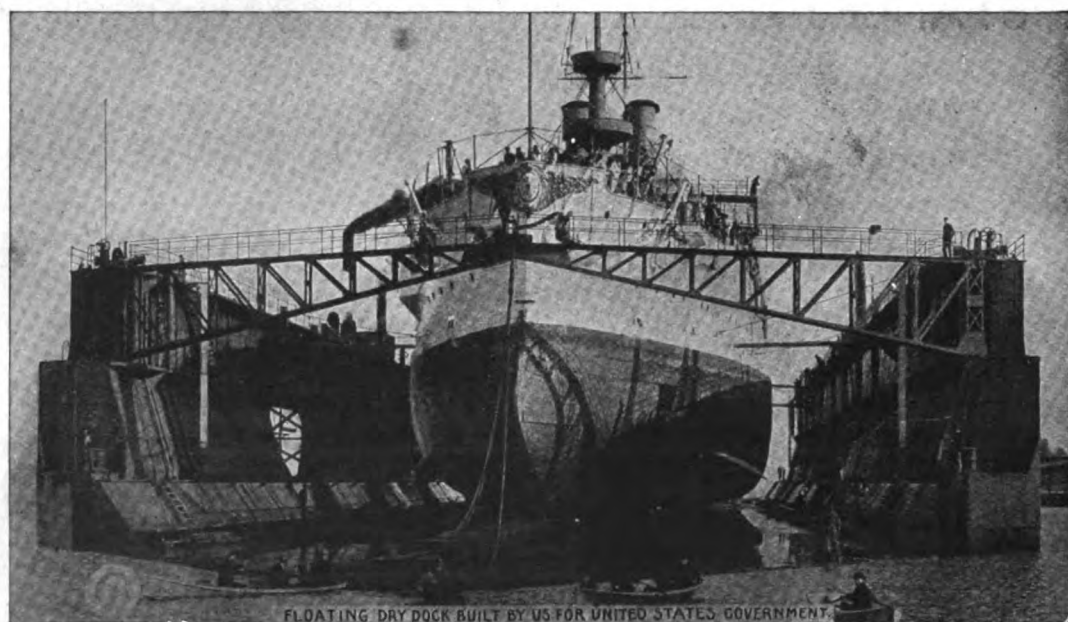
WE FURNISH ONLY THE BEST GRADE OF

**PITTSBURG AND YOUGHIOGHENY COAL**

# MARYLAND STEEL COMPANY

BUILDERS OF STEEL STEAMSHIPS,  
TOW BOATS, SAILING VESSELS,  
BARGES AND STEAM CRAFT  
OF EVERY DESCRIPTION

STEEL FLOATING DRY DOCKS  
CAPABLE OF DOCKING  
THE LARGEST VESSELS



FLOATING DRY DOCK BUILT BY US FOR UNITED STATES GOVERNMENT

SPARROW'S POINT,  
MARYLAND.



Modern Highway and Electric Railway Scherzer Rolling Lift Bridge open for the passage of large vessel. Superseded and replaced a center pier swing bridge.

## More than **60 SCHERZER ROLLING LIFT BRIDGES**

have already been built, superseding and replacing swing bridges and other old types of movable bridges for railroads, electric railways and highways in the most progressive cities and harbors of the world.

### **HIGHEST AWARD**

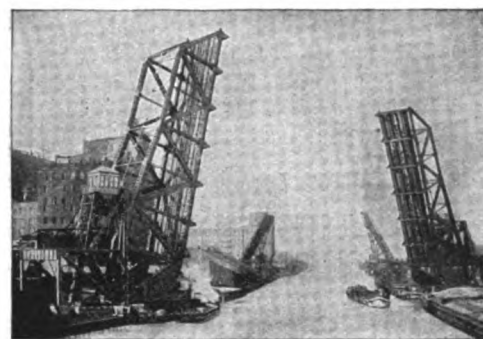
**World's Fair, St. Louis, 1904**

"Center pier swing bridges form **artificial obstructions**, blocking **navigation** and **commerce**. They are condemned, removed and replaced by modern **SCHERZER ROLLING LIFT BRIDGES** wherever **Manufacturing, Commerce, Transportation, Railroads** and **Ships** are valued, protected and advanced."

*Write us for photographs, information, sketches and estimates*

### **THE SCHERZER ROLLING LIFT BRIDGE COMPANY**

**Main Offices: Monadnock Block, Chicago, U. S. A.**



Modern Railroad Scherzer Rolling Lift Bridge in the open position. Longest span Bascule Bridge in the world. Also Highway Scherzer Rolling Lift Bridge open further down the river.

## "Wiltbonco" Steam Plant Accessories

Awarded Gold Medal at Universal  
Exposition, St. Louis, 1904.

### **REFLEX WATER GAUGES AND WILTBONCO GAUGE MOUNTINGS**

Used by all the principal Navies of the world, Merchant Marine, and for Locomotives, Automobiles, Stationary and Portable Boilers.

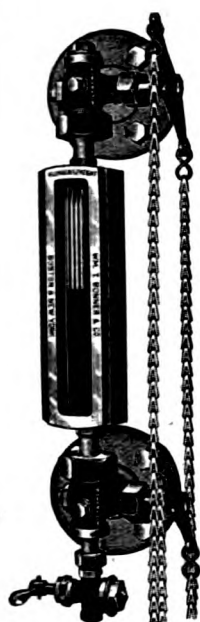
**"THE WATER SHOWS BLACK"**  
**ESPECIALLY ADAPTED FOR HIGH PRESSURE.**

**CUSHION PRESSURE SEATED CONTROL COCKS** For all liquids and gases.

**"FREEPORT" VALVES** For all purposes, but particularly designed for high pressures and superheated steam.

**"SAFETY" PLASTIC METALLIC PACKING,**  
**COOPERITE SHEET PACKING,** For high pressures and superheated steam, acids, ammonia, etc.

**WILTBONCO-HOGAN OIL FILTERS.**



## **The Wm. T. Bonner Co.**

**MERCHANT ENGINEERS, AND MANUFACTURERS**

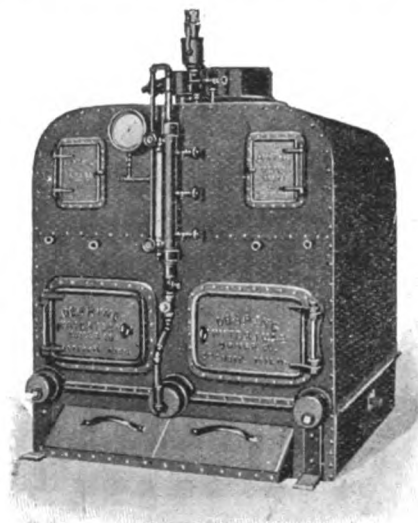
**Head Office, 246 Summer St., Boston. New York Sales Office, 141 Broadway**



# Steamology

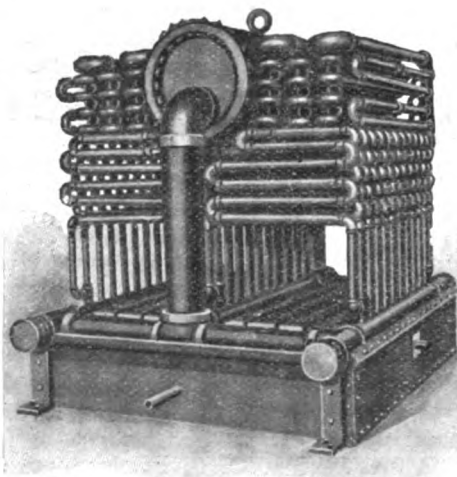
A SCIENTIFIC BUNCHING OF FRUITFUL  
UNITS IN STEAM MAKING MECHANISM

Our pictures are forceful; effective. Thorough draught and diffusion of heat immediately assured. No conflicting currents. Continuous, perfect, economizing combustion and circulation.



FRONT VIEW:

Note, at the top, that Captain of Ideal Power, our Steam Dome, wherefrom the maximum of superheated, dry steam is always and exceptionally possible under natural or forced and non-priming conditions. Then go the other way and understand how readily you may remove impure feed deposits by blow-off pipe, from settling chambers.



BACK VIEW

We prove maximum power and minimum fuel cost. We warrant design and construction proof against common evils of bursting tubes and seams.

## The Dearing Water-Tube Boilers

are unique, in that their installation, the world over, is unquestionable evidence of the highest producing and lasting qualities in the science of steam engineering.

## Dearing' Water-Tube Boiler Co.

DETROIT, MICH.

NECESSARY TO GO FURTHER?  
DROP US A POSTAL.

Two Cycle

# The MIETZ & WEISS OIL ENGINES

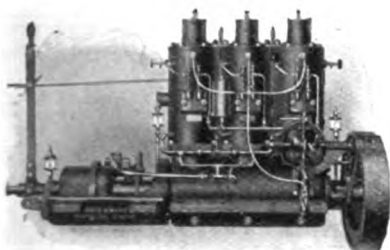
Constant Thrust

—Operated by—

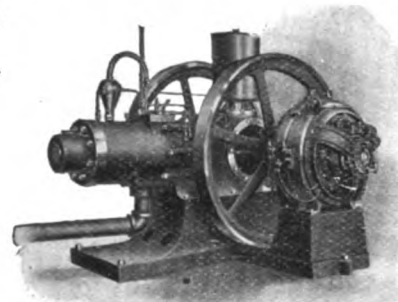
**Kerosene Oil, Fuel Oil, Distillate or Crude Oil.****Simplest, Safest, most Reliable and most Economical Engines on the market.****MARINE TYPE.**

No Valves, Cams or Gears.  
No Electric Sparking Devices.  
Automatic Ignition by Compression.

No Dangerous  
Gasolene  
used.

*1 to 60 horse power.***STATIONARY TYPE.**

Especially adapted for operating electric generators for lighting launches, yachts and house boats. Perfect regulation, greatest economy and absolute safety.

*1 to 75 horse power.*

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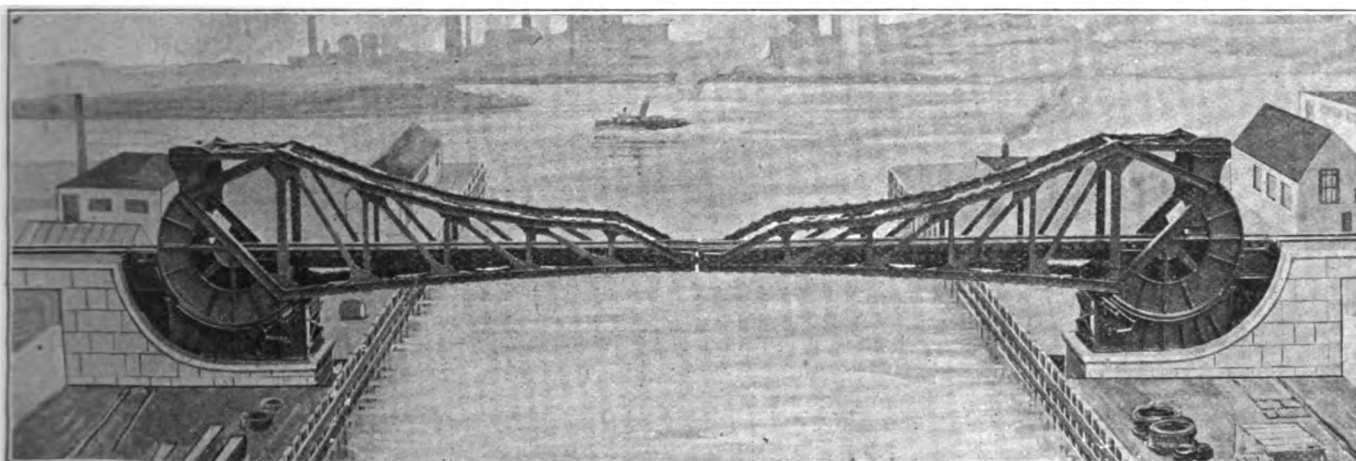
**AUGUST MIETZ,**

Iron Foundry and Machine Works,

128-138 Mott Street

NEW YORK, U.S.A.

## THE COWING LIFT BRIDGE



THE JEFFERSON STREET BRIDGE, CLEVELAND, OHIO.

The Cowing Bridge represents the most modern type of Lift Bridge.

Highest Award at  
St. Louis, Mo. 1904.

Plans and estimates  
promptly furnished.

**JOHN P. COWING**

GEO. P. COBLURN, Eastern Agent  
1201 Fuller Bldg., New York City.

CONTRACTING  
ENGINEER

426 Citizens Building  
CLEVELAND, OHIO

**CORRIGAN, McKINNEY & Co.**

716-719 PERRY-PAYNE BUILDING.

*James Corrigan  
Stevenson Burke  
Price McKinney*

**IRON ORES  
AND PIG IRON.**

*Cleveland, O.* June 1, 1905.

Bird Archer Co.,  
209 Washington St.,  
New York, N. Y.

Gentlemen:-

I was never in favor of using compound until Mr. Bennett induced me to try a trial package at the Genesee Furnace and was very much pleased on opening the boilers to find them free from oil, grease and scale. I find it also stops pitting and corrosion. I am using the compound on all of our boats and furnaces with the same result. I can cheerfully recommend your compound to any engineer who desires a superior article.

Yours truly,

*H. J. Reynolds*

SUPERINTENDING ENGINEER.

## "Steam Turbines"—

An important reference work on scientific Steam Turbine construction with an appendix on Gas Turbines, and the future of Heat Engines. Contains 435 pages 6 x 9 inches, 241 cuts and 3 lithograph tables. Bound in heavy cloth. Price \$4.50.

By DR. A. STODOLA  
ZURICH

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**MARINE REVIEW**  
CLEVELAND

Translated by  
DR. LOUIS C. LOEWENSTEIN  
Lehigh University



Best Form of  
Dry Dock.



## CRANDALL'S MODERN MARINE RAILWAYS

**SAFE AND RAPID**

Built of Steel or Wood  
any size

**H. I. Crandall & Son Co.**

(Incorporated)

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East Boston, Mass., U.S.A.

## THE ROBERTS SAFETY WATER-TUBE BOILER CO.

Manufacturers of  
High Grade

### Marine Water Tube Boilers

Generators of the Highest Quality of Steam  
NEARLY 1500 IN USE

Send for circulars  
and stock sheet

MAIN OFFICE

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Works: Red Bank, N. J.  
Phone, 49 Red Bank

Cable Address  
"Bruniva"

## Lunkenheimer Globe Valves

MADE OF BRASS IN STANDARD SIZES.



POSITIVELY THE  
MOST DURABLE AND  
PRACTICAL  
VALVE ON THE  
MARKET.

IF YOUR LOCAL DEALER CANNOT  
FURNISH THEM, NOTIFY US.

## THE LUNKENHEIMER COMPANY

Largest Manufacturers of Engineering  
Specialties in the world

GENERAL OFFICES  
AND WORKS **Cincinnati, Ohio, U. S. A.**

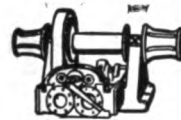
BRANCHES { NEW YORK, 26 Cortlandt St.  
{ LONDON, S. E., 35 Great Dover St.

We manufacture a complete line of Iron and Brass  
Globe and Gate Valves, Hydrostatic and Mechanical  
Lubricators, Injectors and Ejectors, Cocks,  
Generator, Relief and Pop Safety Valves, Whistles,  
Oil and Grease Cups, Etc. 9 M. R.



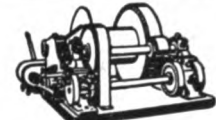
### GASOLINE MARINE ENGINES

Suitable for all Boats from 35 to 200 HP.  
Over 100 in successful use.  
Also the well known and always  
reliable Woolters Gas or Gasoline  
Stationary Engines.



### HOISTING ENGINES

Of all kinds and sizes, and  
for all purposes, especially  
for ship use.  
Docking and Hauling Engines  
and Wire Rope Windlasses.



### AUTOMATIC TOWING MACHINES

Somewhat the cheapest, and  
altogether the best. Positively  
guaranteed.  
Automatic Fog Whistle Machines  
Steam Steering Engines.

FOR THESE AND OTHER WELL KNOWN SPECIALTIES ADDRESS ALL INQUIRIES TO.

**THE CHASE MACHINE CO. Engineers and Machinists, CLEVELAND, OHIO.**

# New York Shipbuilding Company

Main office and works, Camden, N. J., New York office No. 1 Broadway

**Builders of**  
**SHIPS — ENGINES — BOILERS**  
**HEAVY MACHINERY**



Launch of "Mongolia," Pacific Mail S. S. Co., July 25, 1903.  
615 feet long, 65 feet beam, 51 feet deep.

## Best Facilities for Repair Work

**Pneumatic and Electric Tools;  
ample wharfage accomodation.**

**100 ton crane.**

**Repairs done under shelter.**

# Commissioners' Sale

of the Shipbuilding Plant and other  
property of the William R. Trigg Co.

By N. W. BOWE & SON, Real Estate Auctioneers, Richmond, Va.

By virtue of a decree of the Chancery Court of the City of Richmond, Virginia, entered on the 23rd day of May, 1905, in the suit of S. H. Hawes & Co. vs. William R. Trigg Company et als., the undersigned, who were appointed Special Commissioners for that purpose, will proceed to sell, by public auction, on the premises, Richmond, Virginia, to the highest bidder, on

**Monday, the Tenth Day of July, 1905, at 10 o'clock, a. m.**

free of all liens and encumbrances whatsoever, except the easements and burdens hereinafter mentioned, all and singular the following estates, lands, properties, rights, privileges, and franchises, to-wit:

All that certain lot or parcel of land, with the buildings and improvements thereon erected, comprising the ship yards, ship building plant, boundaries, shops, railways, manufactories, offices, piers, wharves and docks of the William R. Trigg Co., situate in the city of Richmond, Virginia, more particularly described in two certain deeds of trust made by the William R. Trigg Co. to the Commercial Trust Co., of Philadelphia, trustee, dated June 1, 1901, and to the Richmond Trust & Safe Deposit Co., trustee, dated June 14, 1902, respectively.

The property will be first offered in parcels, as follows:

**FIRST**—The Richmond Dock, with all rights, easements, privileges and appurtenances thereto belonging, including the franchises of the Richmond Dock Co., together with so much real estate not covered by water as is necessary and appurtenant to its use, as set out and defined in deed dated the first day of June, 1901, from the Chesapeake & Ohio Railway Co. to the William R. Trigg Co., recorded in the clerk's office of the chancery court of the city of Richmond, deed book 171-A, page 245, and subject to the burdens and obligations fixed in said deed.

**SECOND**—Lot No. 1, with the two (2) office buildings thereon:

Lot No. 2, with the machine shop thereon, together with all the machinery, shafting, motors, cranes and hand and small tools now contained therein;

Lot No. 3, with the pattern shop thereon, together with all machinery, shafting, motors and hand and small tools now contained therein;

Lot No. 4, with the foundry building thereon, together with all machinery, shafting, motors, cranes, cupolas and hand and small tools now contained therein;

Lot No. 5, with the Smith shop thereon, together with all machinery, shafting, motors, cranes and hand and small tools now contained therein;

Lot No. 6, with the bending shed and anglesmith shop thereon, together with all machinery, shafting, motors and hand and small tools now contained therein;

Lot No. 7, with the mold loft thereon, together with all machinery, shafting, motors and hand and small tools now contained therein;

Lot No. 8, with the shipfitters' shed thereon, together with all machinery, shafting, motors and hand and small tools now contained therein;

Lot No. 9, with the carpenter and joiner shop thereon, together with all machinery, shafting, motors and hand and small tools now contained therein;

Lot No. 10, being a vacant piece or parcel of land containing three (3) acres, more or less, lying between the Smith shop and the bending shed;

Lot No. 11, being all of the unoccupied real estate lying east of lot No. 9, and containing fourteen (14) acres, more or less, on which said lot is located a launching basin and ship lock.

The exact location, together with their metes and bounds, of the aforesaid tracts of land will appear from the plats in the possession of the undersigned special commissioners and the auctioneer, access to which is open to the public, and blue prints of which will be furnished to any party applying for the same.

**THIRD**—The said special commissioners will then proceed to offer

separately each of the aforesaid lots of land, with the buildings thereon as above indicated, *without* the machinery, tools, etc., contained therein, but with the appliances for electric lighting, wiring for power, automatic sprinklers and heating appliances.

**FOURTH**—The machinery, shafting, motors, cranes and hand and small tools contained in each of the aforesaid buildings in separate parcels, and distinct from the buildings.

**FIFTH**—All cranes, cableways, shear legs, derricks and other machinery and yard equipment outside of the aforesaid buildings, including a floating machine shop and a floating derrick.

**SIXTH**—All of the real estate comprising the plant of the William R. Trigg Co., except the dock with its appurtenances as above described, containing about 30 acres, more or less, together with the buildings thereon.

All of the above real estate, including the aforesaid dock, is sold subject to certain easements, rights, licenses, and privileges reserved by the Chesapeake & Ohio Railway Co. in two certain deeds conveying portions of the aforesaid property to said William R. Trigg Co., dated the 1st of June, 1901, and recorded in the clerk's office of the chancery court of the city of Richmond, in deed book 171-A, pages 245 and 258, and subject to certain easements, rights, licenses and privileges set out in two certain deeds between said William R. Trigg Co. and the Southern Railway, each dated the 21st day of November, 1904, recorded in the aforesaid clerk's office in deed book 183-B, pages 315 and 320.

**SEVENTH**—The said special commissioners will then proceed to offer as a whole the aforesaid land, dock, buildings, machinery, fixtures, equipment and property of every sort, kind and description above referred to, reporting to the court for its acceptance or rejection, the bid or bids aggregating the largest amount of purchase money.

**TERMS**—The terms of said sale, in the event that the said property is sold as a whole, are as follows: \$50,000 in cash, of which \$10,000 shall be paid to the said special commissioners by the purchaser or purchasers on the date of said sale, and \$40,000 when said sale shall have been confirmed by the court; the balance of the purchase money on equal credits of one, two and three years, the purchaser to execute negotiable notes, bearing interest from the date of the confirmation of said sale, for the deferred payments; with the right in the purchaser to pay the whole amount of purchase money in cash, and to anticipate the due date of any or all of said notes. The title to the property to be retained by the court until the whole of the purchase price is paid, and a deed directed to be executed to the purchaser.

If sold in parcels, then the following are the terms: As to all articles of personal property, or property removable under said decree, all cash; as to the real estate, or any parts thereof, one-fourth of the purchase price in cash, and the balance on equal credits of one, two and three years, the deferred payments being evidenced by purchaser's notes, bearing interest from date of confirmation of sale, with the right in the purchaser to anticipate the due date of any or all of said notes, and title to be retained until the entire purchase money is paid and conveyance ordered by the court.

For further information apply to either of the undersigned Special Commissioners or to the Auctioneer.

BEVERLEY B. MUNFORD

LILBURN T. MYERS

} Special Commissioners.

The bond required of the Special Commissioners by the above named decree has been duly executed.

CHARLES O. SAVILLE,

Clerk of the Chancery Court of the City of  
Richmond.



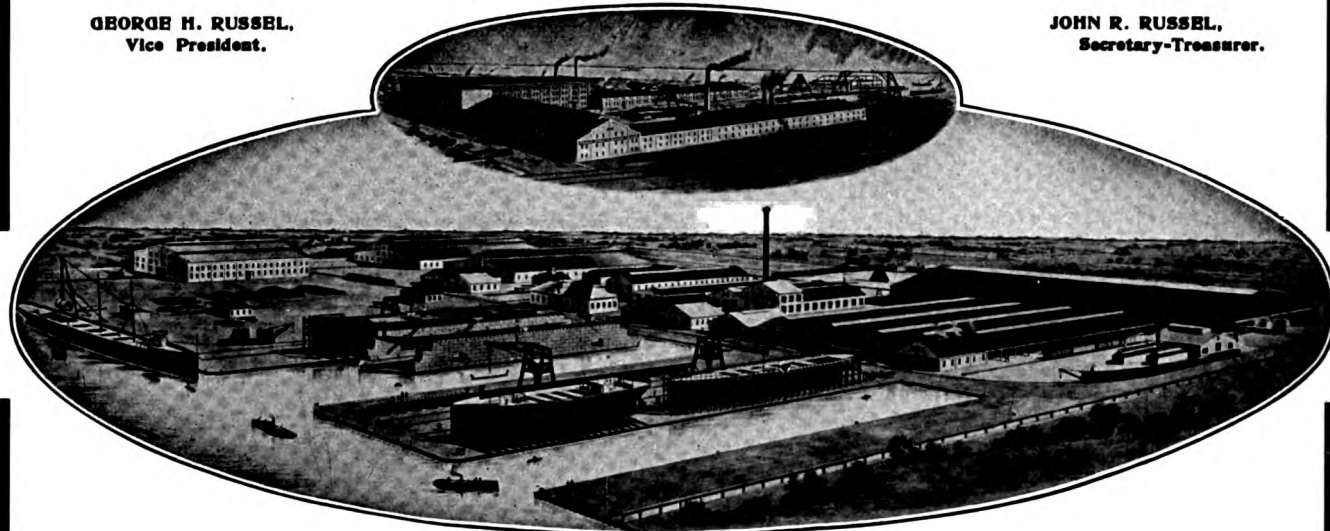
# GREAT LAKES ENGINEERING WORKS

**DETROIT, MICH.**

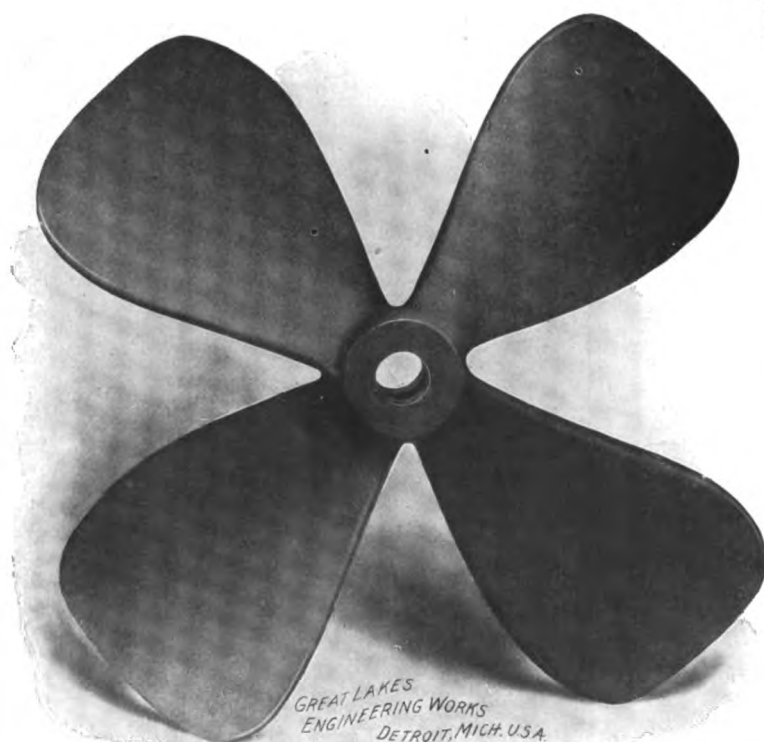
ANTONIO C. PESSANO, President and Gen. Mgr.

GEORGE H. RUSSEL,  
Vice President.

JOHN R. RUSSEL,  
Secretary-Treasurer.



**Steel Ship Builders  
Floating Dock  
Marine Engines  
Marine Repairs  
Hydraulic Dredges  
Hydro Carbon System  
Propeller Wheels**



GREAT LAKES  
ENGINEERING WORKS  
DETROIT, MICH. U.S.A.

## **Semi-Steel Propeller Wheels==**

made either Solid or im-  
proved Sectional Type.  
Our Wheels possess  
many points of merit not  
found in other makes.

**Quick deliveries  
guaranteed.**

# BELLEVILLE WATER-TUBE BOILERS

## NOW IN USE (MARCH, 1905)

On Board Sea-going Vessels, NOT INCLUDING New Installations Building or Erecting.

French Navy	-	-	-	-	-	-	-	-	360,560 H. P.
English Royal Navy	-	-	-	-	-	-	-	-	966,300 "
Russian Imperial Navy	-	-	-	-	-	-	-	-	253,800 "
Japanese Imperial Navy	-	-	-	-	-	-	-	-	122,700 "
Austrian Imperial Navy	-	-	-	-	-	-	-	-	56,700 "
Italian Royal Navy	-	-	-	-	-	-	-	-	32,500 "
Chilian Navy	-	-	-	-	-	-	-	-	26,500 "
Argentine Navy	-	-	-	-	-	-	-	-	13,000 "
The "Messageries Maritimes" Company	-	-	-	-	-	-	-	-	87,600 "
Chemins de fer de l'Ouest: (The French Western Railway Co.)	Steamships								
plying between Dieppe and Newhaven	-	-	-	-	-	-	-	-	18,500 "
Compagnie Generale Transatlantique	-	-	-	-	-	-	-	-	1,500 "
Total Horse Power of Boilers in Use									1,939,660

## Société Anonyme des Etablissements Delaunay Belleville

CAPITAL: 6,000,000 FRANCS

Works and Dock Yards of the Ermitage at Saint-Denis (Seine), France.

Telegraphic Address: Belleville, Saint-Denis-Sur-Seine

### Geo. L. McCurdy

169 Jackson Boulevard

CHICAGO ILLINOIS

## INSURANCE

HULLS and CARGOES

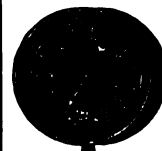
DIRECT REPRESENTATIVE OF LEADING  
AMERICAN AND FOREIGN UNDERWRITERS

### IMMEDIATE SHIPMENT

can always be had from our stock. We make a specialty of prompt service from a complete assortment.

See our monthly stocklist.

THE  
BOURNE-FULLER CO.  
IRON STEEL  
PIG IRON  
COKE  
Cleveland, Ohio.



### ASHTON

Cam Lever Pop Safety Valves  
and Non-Corrosive  
Steam Gauges.

give highest efficiency and durability.  
Specify them and get the best.

The Ashton Valve Co.

Boston New York Chicago

U. S. A.

# Buyers' Directory of the Marine Trade

For a more complete classification than that represented by advertisers in the Marine Review, see the BLUE BOOK OF AMERICAN SHIPPING, marine and naval directory of the United States, published by The Marine Review, Cleveland.

See accompanying index of Advertisers for full addresses of concerns in this directory.

## AIR COMPRESSORS, AIR HOISTS, ETC.

Great Lakes Engineering Works.....Detroit.  
Mietz, Aug. ....New York.

## AIR PORTS, DEAD LIGHTS, ETC.

Marine Mfg. & Supply Co.....New York.

## AIR PUMPS AND APPLIANCES.

Fore River Ship & Engine Co., Quincy, Mass.  
Great Lakes Engineering Works.....Detroit.

## ANCHORS.

Bowers, L. M. & Co.....Binghamton, N. Y.

## ANTI-FRICTION METALS.

Cramp, Wm. & Sons.....Philadelphia.

## ARTIFICIAL DRAFT FOR BOILERS.

American Ship Building Co.....Cleveland.  
Detroit Ship Building Co.....Detroit.  
Great Lakes Engineering Works.....Detroit.  
Sturtevant, B. F., Co.....Hyde Park, Mass.

## ASH EJECTORS.

Great Lakes Engineering Works.....Detroit.

## ATTORNEYS AND PROCTORS IN ADMIRALTY.

Gilchrist, Albert J.....Cleveland.  
Goulder, Holding & Masten.....Cleveland.  
Hoyt, Dustin & Kelley.....Cleveland.  
Jenkins, Russell & Eichelberger.....Cleveland.  
Kremer, C. E.....Chicago.  
MacDonald, Ray G.....Chicago.  
Potter & Potter.....Buffalo.  
Shaw, Warren, Cady & Oakes.....Detroit.  
White, Johnson, McCaslin & Cannon Cleveland

## BAROMETERS, MARINE GLASSES, ETC.

Ritchie, E. S. & Sons.....Brookline, Mass.

## BELT CONVEYORS.

Link Belt Machinery Co.....Chicago.

## BLOCKS, SHEAVES, ETC.

Boston & Lockport Block Co.....Boston, Mass.  
Cleveland Block Co.....Cleveland.

## BLOWERS.

Power Specialty Co.....Detroit.  
Sturtevant, B. F. Co.....Hyde Park, Mass.

## BOAT BUILDERS.

Drein, Thos. & Son.....Wilmington, Del.  
Kahnweiler's Sons, David.....New York.  
Lane & DeGroot.....Long Island City, N. Y.  
Marine Construction & D. D. Co.....  
.....Mariner's Harbor, S. I., N. Y.  
Truscott Boat Mfg. Co.....St. Joseph, Mich.  
Willard, Chas. P. & Co. Winthrop Harbor, Ill.

## BOILER CLEANING DEVICE.

Power Specialty Co.....Detroit.

## BOILER COMPOUNDS.

Dearborn Drug & Chemical Works....Chicago.

## BOILER MANUFACTURERS.

Almy Water Tube Boiler Co., Providence, R. I.  
American Ship Building Co.....Cleveland.  
Atlantic Works.....East Boston, Mass.  
Babcock & Wilcox Co.....New York.  
Chicago Ship Building Co.....Chicago.  
Cramp, Wm. & Sons.....Philadelphia.  
Dearing Water Tube Boiler Co.....Detroit.  
DeLaunay, Belleville & Co., St. Denis, France.  
Detroit Ship Building Co.....Detroit.  
East End Boiler Works.....Detroit.  
Fletcher, W. A. & Co.....Hoboken, N. J.  
Fore River Shipbuilding Co., Quincy, Mass.  
Georgian Bay Engineering Works.....  
.....Midland, Ont.  
Great Lakes Engineering Works.....Detroit.  
Kingsford Foundry & Machine Works.....  
.....Oswego, N. Y.  
Marine Iron Works.....Chicago.

## BOILER MANUFACTURERS—Continued.

Maryland Steel Co.....Sparrows Point, Md.  
Milwaukee Dry Dock Co.....Milwaukee.  
Mosher Water Tube Boiler Co.....New York.  
Newport News Ship Building Co.....  
.....Newport News, Va.  
New York Shipbuilding Co.....Camden, N. J.  
Northwestern Steam Boiler & Mfg. Co.....  
.....Duluth, Minn.  
Quintard Iron Works Co.....New York.  
Roberts Safety Water Tube Boiler Co.....  
.....New York.  
Stirling, The Co.....New York.  
Superior Ship Building Co.....Superior, Wis.  
Taylor Water Tube Boiler Co.....Detroit.

## BOILER RIVETS.

Bourne-Fuller Co.....Cleveland.

## BOILER STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.

Falls Hollow Staybolt Co., Cuyahoga Falls, O.

## BRASS AND BRONZE CASTINGS.

Cramp, Wm. & Sons.....Philadelphia.  
Fore River Ship & Engine Co., Quincy, Mass.  
Great Lakes Engineering Works.....Detroit.  
Lunkenheimer Co.....Cincinnati.  
Macbeth Iron Co.....Cleveland.

## BRIDGES, BUILDERS OF.

Cowing, John P.....Cleveland.  
Scherzer Rolling Lift Bridge Co.....Chicago.

## BUCKETS, ORE AND COAL.

Brown Hoisting & Conveying Machine Co.....  
.....Cleveland.  
McMyler Mfg. Co.....Cleveland.  
Mayo & Bailey.....Chicago.

## BULKHEAD DOORS, WATERTIGHT.

"Long Arm" System Co.....Cleveland.

## CABIN AND CABINET FINISHING WOODS.

Martin-Darriss Co.....Cleveland.

## CANVAS SPECIALTIES.

Baker & Co., H. H.....Buffalo.  
Bunker, E. A.....New York.  
Upson-Walton Co.....Cleveland.

## CAPSTANS.

American Ship Windlass Co., Providence, R. I.  
Hyde Windlass Co.....Bath, Me.  
Marine Mfg. & Supply Co.....New York.

## CEMENT, IRON FOR REPAIRING LEAKS.

Smooth-On Mfg. Co.....Jersey City, N. J.

## CHAINS.

Woodhouse Chain Works.....Trenton, N. J.

## CHAIN CONVEYORS, HOISTS.

Brown Hoisting Machinery Co. (Inc.)....  
.....Cleveland.  
General Electric Co.....Schenectady, N. Y.

## CHAIN HOISTS.

Boston & Lockport Block Co.....Boston, Mass.

## CHARTS.

Penton Publishing Co.....Cleveland.  
Potter, J. D.....London.

## CLOCKS (Marine and Ship's Bell) AND CHRONOMETERS.

Ashton Valve Co.....Boston.  
Ritchie, E. S. & Sons.....Brookline, Mass.

## COAL PRODUCERS AND SHIPPERS.

Hanna, M. A. & Co.....Cleveland.  
Ironville Dock & Coal Co.....Toledo, O.  
Pickands, Mather & Co.....Cleveland.  
Pittsburg Coal Co.....Cleveland.

## COAL AND ORE HANDLING MACHINERY.

Brown Hoisting Machinery Co. (Inc.)....  
.....Cleveland.  
Link Belt Machinery Co.....Chicago.  
McMyler Mfg. Co.....Cleveland.

## COMPASSES.

Ritchie, E. S. & Sons.....Brookline, Mass.

## CONDENSERS.

Great Lakes Engineering Works.....Detroit.  
Thropp & Sons Co., John E.....Trenton, N. J.

## CONTRACTORS FOR PUBLIC WORKS.

Breymann & Bros., G. H.....Toledo.  
Buffalo Dredging Co.....Buffalo.  
Dunbar & Sullivan Dredging Co.....Buffalo.  
Fitz-Simons & Connell Co.....Chicago.  
Great Lakes Dredge & Dock Co.....Chicago.  
Hickler Bros.....Sault Ste. Marie, Mich.  
Lake Superior Contracting & Dredging Co.,  
.....Duluth, Minn.  
Smith Co., L. P. & J. A.....Cleveland.  
Starke Dredge & Dock Co., C. H.....Milwaukee.  
Sullivan, M.....Detroit.

## CORDAGE.

Baker & Co., H. H.....Buffalo.  
Upson-Walton Co.....Cleveland.

## CORK JACKETS AND RINGS.

Armstrong Cork Co.....Pittsburg, Pa.  
Kahnweiler's Sons, D.....New York.

## CRANES, TRAVELING.

Brown Hoisting Machinery Co.....Cleveland.  
McMyler Mfg. Co.....Cleveland.

## DIVING APPARATUS.

Morse, A. J. & Son.....Boston.  
Schrader's Son, Inc., A.....New York.

## DREDGING CONTRACTORS.

Breymann & Bros., G. H.....Toledo.  
Buffalo Dredging Co.....Buffalo.  
Dunbar & Sullivan Dredging Co.....Buffalo.  
Fitz-Simons & Connell Co.....Chicago.  
Great Lakes Dredge & Dock Co.....Chicago.  
Hickler Bros.....Sault Ste. Marie, Mich.  
Lake Superior Contracting & Dredging Co.,  
.....Duluth, Minn.  
Smith Co., L. P. & J. A.....Cleveland.  
Starke Dredge & Dock Co., C. H.....Milwaukee.  
Sullivan, M.....Detroit.

## DREDGING MACHINERY.

Quintard Iron Works Co.....New York.

## DRYING APPARATUS.

Sturtevant, B. F. Co.....Hyde Park, Mass.

## DRY DOCKS.

American Ship Building Co.....Cleveland.  
Atlantic Works.....East Boston, Mass.  
Buffalo Dry Dock Co.....Buffalo.  
Chicago Ship Building Co.....Chicago.  
Craig Ship Building Co.....Toledo, O.  
Cramp, Wm. & Sons.....Philadelphia.  
Detroit Ship Building Co.....Detroit.  
Great Lakes Engineering Works.....Detroit.  
Lockwood Mfg. Co.....East Boston, Mass.  
Milwaukee Dry Dock Co.....Milwaukee.  
Newport News Ship Building Co.....  
.....Newport News, Va.  
Shipowners Dry Dock Co.....Chicago.  
Superior Ship Building Co.....Superior, Wis.

## ELECTRIC HOISTS AND CRANES.

General Electric Co.....Schenectady, N. Y.

## ELECTRIC LIGHT AND POWER PLANTS.

General Electric Co.....Schenectady, N. Y.  
Mietz, Aug.....New York.  
Sturtevant, B. F. & Co.....Hyde Park, Mass.  
Thropp & Sons, John E.....Trenton, N. J.



**WANTED and FOR SALE Department.****PROPOSALS.**

SEALED PROPOSALS will be received at the office of the Light-House Engineer, Detroit, Mich., until 3 o'clock p. m., July 31, 1905, and then opened, for furnishing the materials and labor of all kinds necessary for the construction of a wharf, oil-house, and buoy shed for a light-house depot on Minnesota Point, Minn., in accordance with specifications, copies of which, with blank proposals and other information, may be had upon application to MAJOR LANSING H. BEACH, Corps of Engineers, U. S. A., Engineer. July 13

**FOR SALE.****Marine Engine & Boilers.**

Fore and aft compound engine, 28—48 x 40.  
Two fire box boilers 9½ ft. by 15½ ft.  
Address, G. A. Trueman, Munising, Michigan.

**For Sale Cheap.**

Beautiful model 37¼ inches long, of passenger steamer City of Detroit. May be seen at D. & C. ticket office window, 28 Public Square, Cleveland. For photograph and full particulars, address R. J. Barrow, 102 Woodbridge avenue, Cleveland, Ohio.

**Wreck of Continental For Sale.**

Wreck of steamer "Continental" as she lies about two miles north of Twin River Point, Wisconsin. Also articles saved from wreck, particulars of which will be given upon application. Address Chas. E. & W. F. Peck, Cleveland, O.

**Scotch Marine Boilers.**

Four new, Scotch Marine Boilers, 10 ft. diameter and 11 ft. long. Will pass inspection for 200 lbs. working pressure. Quick delivery. Low price. Address B. M., care Marine Review, Cleveland.

**FOR SALE.****For Sale.**

One hundred and seventy-five thousand (175,000) ft. wire rope, the following sizes: ¼, ½, ¾, ¾, 1 in., 1½ and 2½ in.; the lengths will run from 100 feet up to 5,000 ft. long. 10,000 lb. chain and chain slings. 1,000 iron cots. 5,000 ft. hose, all sizes. Iron and wooden blocks, all sizes. Canvas covers; also lot of canvas sails. 100 government tents, all sizes. Pick axes, axes, lanterns, crow bars, iron wheel barrows, iron tubs. 100 kegs spikes and nails. 10,000 ft. Manila ropes, all sizes. 5,000 ft. galvanized pipe, also iron pipe, all sizes. Also, large assortment of valves and different sizes of centrifugal pumps. These goods only been used a few days, and are as good as new. Will sell any of these goods separate at a bargain. The wire rope is well oiled and free from all kinds of rust.

Large 6 in. Manila Hawser, 1,000 lb. copper rivets also 20 large rolls rubber belting, sizes 30, 24, 20, 48 in.

EDWARD J. KANE,  
260 Front Street,

Cor. Dover Street, New York.

**For Sale.**

Two 10 K. W. direct connected electric dynamos and engines, 125 volt, for marine work; good condition; cheap. JORDAN BROS., 74 Beekman St., New York.

**For Sale.**

Tugs—One 18 x 18; one 14 x 16; one 10 x 12. Clam shell dredge with dipper arrangement. Machinery, iron work and equipment for 2½-yard dipper dredge. Machinery for clam shell dredge. Flat scow 112 x 32 x 9. Two 100-yard dump scows. Carkin, Stickney & Cram, Detroit, Mich.

**FOR SALE.****Marine Boiler.**

For Sale.—One 50 H. P. Scotch Marine Boiler, 10 ft. long, 78 in. diameter, 160 lbs. steam pressure. Manufactured by Ritter & Co., Buffalo, N. Y. In first-class shape. For particulars, write The Detroit Stove Works, Detroit, Mich. .f.

**Dock Lease for Sale.**

Long lease of valuable dock at Sault Ste. Marie, Mich. Will sell or rent for long or short term. F. R. Warner, Trustee, Sault Ste. Marie, Mich.

**The Steamer Gordon Campbell.**

Burned on spar-deck—easy to cut down to lumber barge, to carry million feet. Machinery and boilers untouched. Hull untouched and in good condition. Boat in dry dock and thoroughly overhauled last summer. Can be seen in Chicago. Want best offer. Address Room 613, 59 Dearborn St., Chicago. t f

**Spile Driver and Scow For Sale.**

A spile driver and scow 55 ft. x 28 ft., square end, drop 50 ft.; two hammers 3,800 lb. and 2,000 lb. Double 8¼ x 10 engines, vertical boiler. Cables, blocks, lines, tools, etc., all in complete working order. Immediate delivery. May be inspected at Detroit. Michigan Contracting Co., 860 Greenwood Ave., Detroit, Mich.

**Barge.**

FOR SALE.—Small steam barge. For particulars, address Box 36, Manistique, Mich.

**FOR SALE****The D. Robeson SHIP CHANDLERY BUSINESS at PORT HURON, MICH.**

Established 36 years. Does a large business in the sale of Cordage, Duck, Wire Rope, Blocks, Paints, Oils, Varnishes. Brushes; Roofing, Rubber Hose, Building Paper. Manufacturer of Sails, Flags, Tents and Awnings. Building is 40 x 70, two story brick, located close to boat landing. Ill health reason for disposing of real estate and business. For further particulars, write to

SCHOOLCRAFT & CO., Port Huron, Mich.

**For Sale**

Launch Factory and stock of engines and high grade hulls, finished and unfinished. One of the best factories in the country, with new machinery, good buildings, a fine testing tank, and excellent facilities for launching and shipping. Located above high water on the Ohio River. Frontage of ground, 250 ft., depth, 800 ft. Also a stock of fine launches 18 to 30 ft. long, lumber and other material. This property must be sold. Stockholders are engaged in other businesses and can not give it attention. With proper management and attention a fine business can be established. Write for particulars, or come and see the plant.

Neptune Launch & Mfg. Co.

Evansville,

Indiana.

**If you have any second hand vessel property or marine machinery that you want to dispose of, this page will do it for you in short order. Try it.**

## Buyers' Directory of the Marine Trade.—Continued.

**ENGINE BUILDERS, MARINE.**

American Ship Building Co.....Cleveland.  
 Atlantic Works.....East Boston, Mass.  
 Chicago Ship Building Co.....Chicago.  
 Chase Machine Co.....Cleveland.  
 Cramp, Wm. & Sons.....Philadelphia.  
 Craig Ship Building Co.....Toledo, O.  
 Dake Engine Co.....Grand Haven, Mich.  
 Detroit Ship Building Co.....Detroit.  
 Fletcher, W. & A. Co.....Hoboken, N. J.  
 Fore River Shipbuilding Co.....Quincy, Mass.  
 Great Lakes Engineering Works.....Detroit, Mich.  
 Hall Bros.....Philadelphia.  
 Lockwood Mfg. Co.....East Boston, Mass.  
 Marine Iron Works.....Chicago.  
 Maryland Steel Co.....Sparrows Point, Md.  
 Mietz, Aug.....New York.  
 Milwaukee Dry Dock Co.....Milwaukee.  
 Mosher, Chas. D.....New York.  
 Moulton Steering Engine Co.....New York.  
 Newport News Ship Building Co.....Newport News, Va.  
 New York Shipbuilding Co.....Camden, N. J.  
 Northwestern Steam Boiler & Mfg. Co.....Duluth, Mich.  
 Quintard Iron Works Co.....New York.  
 Koch's Ship Yard.....Chester, Pa.  
 Sheriffs Mfg. Co.....Milwaukee.  
 Superior Ship Building Co.....Superior, Wis.  
 Thropp, J. E. & Sons Co.....Trenton, N. J.  
 Trout, H. G.....Buffalo.

**ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.**

Cory, Chas. & Son.....New York.  
 Marine Mfg. Supply Co.....New York.

**ENGINE TESTING.**

Kreer & Parsons.....Chicago.

**ENGINEERING SPECIALTIES AND SUPPLIES.**

Crane Co.....Chicago.  
 Kieley & Mueller.....New York.  
 Lunkenheimer Co.....Cincinnati.  
 New York Belting & Packing Co.....New York.  
 Northwestern Steam Boiler & Mfg. Co.....Duluth, Minn.

**ENGINEERS, MARINE, MECHANICAL, CONSULTING.**

Hynd, Alexander.....Cleveland.  
 Hunt, Robt. W. & Co.....Chicago.  
 Kidd, Joseph.....Duluth, Minn.  
 Kreer & Parsons.....Chicago.  
 Lovejoy, H. O.....Buffalo.  
 Mosher, Chas. D.....New York.  
 Nacey, James.....Cleveland.  
 Rice, Henry.....Buffalo.  
 Roelker, H. B.....New York.  
 Wood, W. J.....Chicago.

**FANS FOR VENTILATION, EXHAUST, ETC.**

Sturtevant, B. F. Co.....Hyde Park, Mass.

**FEED WATER PURIFIERS AND HEATERS.**

Greacen-Derby Engineering Co.....Perth Amboy, N. J.  
 Ross Valve Co.....Troy, N. Y.

**FIRE EXTINGUISHERS.**

Safety Fire Extinguisher Co.....New York.

**FIXTURES FOR LAMPS, OIL OR ELECTRIC.**

General Electric Co.....Schenectady, N. Y.

**FORGES.**

Sturtevant, R. F. Co.....Boston.  
 Sutton Co., C. E.....Toledo, O.

**FORGINGS FOR CRANK, PROPELLER OR THRUST SHAFTS, ETC.**

Cleveland City Forge & Iron Co.....Cleveland.  
 Fore River Shipbuilding Co.....Quincy, Mass.  
 Macbeth Iron Co.....Cleveland.

**FLUE WELDING.**

Fix's, S. Sons.....Cleveland.

**FUEL ECONOMIZERS.**

Sturtevant Co., B. F.....Hyde Park, Mass.

**FUELING COMPANIES AND COAL DEALERS.**

Hanna, M. A. & Co.....Cleveland.  
 Ironville Dock & Coal Co.....Toledo, O.  
 Parker Bros. Co., Ltd.....Detroit.  
 Pickands, Mather & Co.....Cleveland.  
 Pittsburg Coal Co.....Cleveland.  
 Smith, Stanley B., & Co.....Detroit.  
 Smith Coal & Dock Co., Stanley B. Toledo, O.

**FUELING PLANTS, BUILDERS OF**  
 Link Belt Machinery Co.....Chicago.

**FURNACES FOR BOILERS.**

Continental Iron Works.....New York.

**GAS BUOYS.**

Safety Car Heating & Lighting Co.....New York.

**GAS AND GASOLINE ENGINES.**

Chase Machine Co.....Cleveland.  
 Georgian Bay Engineering Works.....Midland, Ont.

**GAUGES, STEAM AND VACUUM.**

Ashton Valve Co.....Boston.  
 Lunkenheimer Co.....Cincinnati.

**GAUGES, WATER.**

Bonner Co., Wm. T.....Boston.  
 Lunkenheimer Co.....Cincinnati, O.

**GRAPHITE.**

Dixon Crucible Co., Joseph.....Jersey City, N. J.

**GREASE EXTRACTORS.**

Greacen-Derby Engineering Co.....Perth Amboy, N. J.

**HAMMERS, STEAM.**

Chase Machine Co.....Cleveland.

**HEATING APPARATUS.**

Sturtevant, B. F. Co.....Hyde Park, Mass.  
 Sutton Co., C. E.....Toledo, O.

**HOISTS FOR CARGO, ETC.**

American Ship Building Co.....Cleveland.  
 Brown Hoisting Machinery Co. (Inc.).....Cleveland.  
 Chase Machine Co.....Cleveland.  
 General Electric Co.....New York.  
 Georgian Bay Engineering Works.....Midland, Ont.  
 Hyde Windlass Co.....Bath, Me.  
 McMyler Mfg. Co.....Cleveland.  
 Marine Iron Co.....Bay City.  
 Mietz, Aug.....New York.

**HOLLOW SHAFTINGS, IRON OR STEEL.**

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

**HOLLOW STAYBOLT IRON.**

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

**HYDRAULIC DREDGES.**

Great Lakes Engineering Works.....Detroit.

**HYDRAULIC TOOLS.**

Watson-Stillman Co., The.....New York.

**ICE MACHINERY.**

Great Lakes Engineering Works.....Detroit.  
 Roelker, H. B.....New York.

**INDICATORS FOR STEAM ENGINES.**

Ashton Valve Co.....Boston.

**INJECTORS.**

American Injector Co.....Detroit.  
 Crane Co.....Chicago.  
 Jenkins Bros.....New York.  
 Lunkenheimer Co.....Cincinnati.  
 Penberthy Injector Co.....Detroit, Mich.

**INSURANCE, MARINE.**

Elphicke, C. W. & Co.....Chicago.  
 Fleming & Co., E. J.....Chicago.  
 Gilchrist & Co., C. P.....Cleveland.  
 Hawgood & Co., W. A.....Cleveland.  
 Helm & Co., D. T.....Duluth.  
 Hutchinson & Co.....Cleveland.  
 McCarthy, T. R.....Montreal.  
 McCurdy, Geo. L.....Chicago.  
 Mitchell & Co.....Cleveland.  
 Parker Bros. Co., Ltd.....Detroit.  
 Peck, Chas. E. & W. F. New York & Chicago.  
 Prindville & Co.....Chicago.  
 Richardson, W. C.....Cleveland.  
 Sullivan, D. & Co.....Chicago.

**IRON CASTINGS.**

Sutton Co., C. E.....Toledo, O.

**IRON ORE AND PIG IRON.**

Bourne-Fuller Co.....Cleveland, O.  
 Hanna, M. A. & Co.....Cleveland.  
 Pickands, Mather & Co.....Cleveland.

**LAUNCHES—STEAM, NAPHTHA, ELECTRIC.**

Georgian Bay Engineering Works.....Midland, Ont.  
 Marine Iron Works.....Chicago.  
 Truscott Boat Mfg. Co.....St. Joseph, Mich.  
 Willard, Chas. P.....Winthrop Harbor, Ill.

**LIFE PRESERVERS, LIFE BOATS, BUOYS.**

Armstrong, Cork Co.....Pittsburg.  
 Drein, Thos. & Son.....Wilmington, Del.  
 Gaynor, T. F.....New York.  
 Kahnweiler's Sons, D.....New York.  
 National Cork Co.....Brooklyn.

**LIGHTS, SIDE AND SIGNAL.**

Russell & Watson.....Buffalo.

**LOGS.**

Nicholson Ship Log Co.....Cleveland.  
 Walker & Sons, Thomas.....Birmingham, Eng.  
 Also Ship Chandlers.

**LUBRICATING GRAPHITE.**

Dixon Crucible Co., Joseph.....Jersey City, N. J.

**LUBRICATORS.**

Crane Co.....Chicago.  
 Lunkenheimer Co.....Cincinnati.

**LUMBER.**

Martin-Barriss Co.....Cleveland.

**MACHINISTS.**

Chase Machine Co.....Cleveland.  
 Hickler Bros.....Sault Ste. Marie, Mich.  
 Lockwood Mfg. Co.....East Boston, Mass.

**MACHINE TOOLS (WOOD WORKING).**

Atlantic Works, Inc.....Philadelphia.

**MARINE RAILWAYS.**

Hickler Bros.....Sault Ste. Marie, Mich.

**MARINE RAILWAYS, BUILDERS OF.**

Crandall & Son, H. I.....East Boston, Mass.

**MATTRESSES, CUSHIONS, BEDDING.**

Fogg, M. W.....New York.

**MECHANICAL DRAFT FOR BOILERS.**

American Ship Building Co.....Cleveland.  
 Detroit Ship Building Co.....Detroit.  
 Great Lakes Engineering Works.....Detroit.  
 Sturtevant, B. F. Co.....Hyde Park, Mass.

**METALLIC PACKING.**

Katzenstein, L. & Co.....New York.

**MOTORS, GENERATORS—ELECTRIC.**

Fisher Electrical Works.....Detroit.  
 General Electric Co.....Schenectady, N. Y.  
 Sturtevant, B. F. Co.....Hyde Park, Mass.

**NAUTICAL INSTRUMENTS.**

Ritchie, E. S., & Sons.....Brookline, Mass.

**NAVAL ARCHITECTS.**

Hynd, Alexander.....Cleveland.  
 Kidd, Joseph.....Duluth, Minn.  
 Kreer & Parsons.....Chicago.  
 Lovejoy, H. O.....Buffalo.  
 Mosher, Chas. D.....New York.  
 Nacey, James.....Cleveland.  
 Rice, Henry.....Buffalo.  
 Wood, W. J.....Chicago.

**OAKUM.**

Stratford, Oakum Co.....Jersey City, N. J.

**OIL ENGINES.**

Mietz, Aug.....New York.

**OILS AND LUBRICANTS.**

Dixon Crucible Co., Joseph.....Jersey City, N. J.  
 Standard Oil Co.....Cleveland.

**PACKING.**

Crane Co.....Chicago.  
 Jenkins Bros.....New York.  
 Katzenstein, L. & Co.....New York.

**PAINTS.**

Baker, Howard H. & Co.....Buffalo.  
 Upson-Walton Co.....Cleveland.

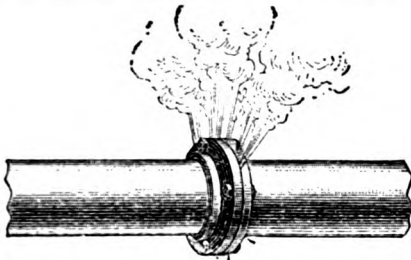
**PATTERN SHOP MACHINERY.**

Atlantic Works, Inc.....Philadelphia.

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in all its  
Branches

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will stop leaks like the above with  
steam on. Write us about it.

**SMOOTH-ON MFG. CO., JERSEY CITY, N. J., U.S.A.**

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in time of danger depends upon the closure of the ship's bulkhead doors. A long series of maritime disasters shows that this can only be accomplished by means of

**THE "LONG-ARM" SYSTEM.**

By this system, consisting of a central emergency station from which power doors and hatch-plates are unfailingly controlled, the electric motor does the work, leaving nothing to chance or individual initiative and bravery. Adopted after searching tests for use on 36 vessels of the United States Navy. *Further information may be obtained from*

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Contains no chemicals, only air. Proven by many years' service in the tropics on United States men-of-war, steam yachts and passenger steamers. A hundred are in daily service on steamers.

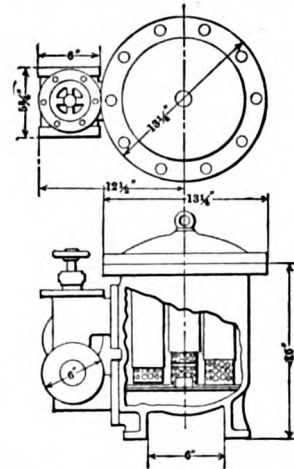
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**REFLEX FILTERS**

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Guaranteed indisputable merits over any other Filter on the market, viz.: Effective surface per Boiler Horse-Power. Weight per H.-P. Rating. Efficiency due to double filtration.

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**LIGHT  
STRONG  
DURABLE**

**CLOTH  
THAT'S IN  
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*Repairing of Hulls and Machinery.*

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**Marine Castings a Specialty**



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**PILE DRIVING AND SUBMARINE WORK.**

Buffalo Dredging Co. .... Buffalo.  
 Dunbar & Sullivan Dredging Co. .... Buffalo.  
 Fitz-Simons & Connell Co. .... Chicago.  
 Great Lakes Dredge & Dock Co. .... Chicago.  
 Hickler Bros. .... Sault Ste. Marie, Mich.  
 Lake Superior Contracting & Dredging Co. .... Duluth, Minn.  
 Parker Bros. Co., Ltd. .... Detroit.  
 Smith Co., L. P. & J. A. .... Cleveland.  
 Starke Dredge & Dock Co., C. H. .... Milwaukee.  
 Sullivan, M. .... Detroit

**PIPE, WROUGHT IRON.**

Bourne-Fuller Co. .... Cleveland, O.  
 Crane Co. .... Chicago.  
 Macbeth Iron Co. .... Cleveland.  
 Reading Iron Co. .... Reading, Pa.

**PLANING MILL MACHINERY.**

Atlantic Works, Inc. .... Philadelphia.

**PLATES—SHIP, STRUCTURAL, ETC.**

Bourne-Fuller Co. .... Cleveland, O.  
 Otis Steel Co. .... Cleveland.

**PRESSURE REGULATORS.**

Kieley & Mueller ..... New York.  
 Ross Valve Co. .... Troy, N. Y.

**PROPELLER WHEELS.**

American Ship Building Co. .... Cleveland.  
 Atlantic Works ..... East Boston, Mass.  
 Cramp, Wm. & Sons ..... Philadelphia.  
 Detroit Ship Building Co. .... Detroit.  
 Fore River Shipbuilding Co. .... Quincy, Mass.  
 Great Lakes Engineering Works ..... Detroit.  
 Hyde Windlass Co. .... Bath, Me.  
 Lockwood Mfg. Co. .... East Boston, Mass.  
 Marine Iron Works ..... Chicago.  
 Milwaukee Dry Dock Co. .... Milwaukee.  
 Newport News Ship Building Co. .... Newport News, Va.  
 Roelker, H. B. .... New York.  
 Sheriffs Mfg. Co. .... Milwaukee.  
 Superior Ship Building Co. .... Superior, Wis.  
 Thropp & Sons Co., J. E. .... Trenton, N. J.  
 Trout, H. G. .... Buffalo.

**PROJECTORS, ELECTRIC.**

General Electric Co. .... Schenectady, N. Y.

**PUMPS FOR VARIOUS PURPOSES.**

Blake, Geo. F., Mfg. Co. .... New York.  
 Great Lakes Engineering Works ..... Detroit.  
 Marine Iron Works ..... Chicago.  
 Kingsford Foundry & Machine Works. .... Oswego, N. Y.

**PUNCHES AND SHEARS.**

Sutton Co., C. E. .... Toledo, O.

**RANGES.**

Stamford Foundry Co. .... Stamford, Conn.

**REFRIGERATING APPARATUS.**

Great Lakes Engineering Works ..... Detroit.  
 Roelker, H. B. .... New York.

**REGISTER FOR CLASSIFICATION OF VESSELS.**

Great Lakes Register ..... Cleveland.

**REPAIRS—ENGINE AND BOILER.**

(See also Boiler Manufacturers and Engine Builders.)  
 Georgian Bay Engineering Works ..... Midland, Ont.

**RIVETS, STEEL FOR SHIPS AND BOILERS.**

Bourne-Fuller Co. .... Cleveland, O.

**SAFETY VALVES.**

Ashton Valve Co. .... Boston.  
 Crane Co. .... Chicago.  
 Lunkenheimer Co. .... Cincinnati.

**SAIL MAKERS.**

Baker, Howard H. & Co. .... Buffalo.  
 Upson-Walton Co. .... Cleveland.

**SALVAGE COMPANIES.**

See Wrecking Companies.

**SEARCH LIGHTS.**

General Electric Co. .... Schenectady, N. Y.

**SHAFTING, HOLLOW.**

Falls Hollow Staybolt Co. .... Cuyahoga Falls, O.

**SHEARS.**

See Punches, and Shears.

**SHIP AND BOILER PLATES AND SHAPES.**

Bourne-Fuller Co. .... Cleveland, O.  
 Otis Steel Co. .... Cleveland.

**SHIP BUILDERS.**

American Ship Building Co. .... Cleveland.  
 Atlantic Works ..... East Boston, Mass.  
 Buffalo Dry Dock Co. .... Buffalo.  
 Cramp, Wm. & Sons ..... Philadelphia.  
 Craig Ship Building Co. .... Toledo, O.  
 Chicago Ship Building Co. .... Chicago.  
 Detroit Ship Building Co. .... Detroit.  
 Fore River Shipbuilding Co. .... Quincy, Mass.  
 Great Lakes Engineering Works ..... Detroit.  
 Lockwood Mfg. Co. .... East Boston, Mass.  
 Maryland Steel Co. .... Sparrows Point, Md.  
 Milwaukee Dry Dock Co. .... Milwaukee.  
 Newport News Ship Building Co. .... Newport News, Va.  
 New York Shipbuilding Co. .... Camden, N. J.  
 Roach's Ship Yard ..... Chester, Pa.  
 Shipowner's Dry Dock Co. .... Chicago.  
 Smith & Son, Abram ..... Algonac, Mich.  
 Willard, Chas. P. & Co. Winthrop Harbor, Ill.

**SHIP CHANDLERS.**

Baker, Howard H. & Co. .... Buffalo.  
 Marine Mfg. & Supply Co. .... New York.  
 Upson-Walton Co. .... Cleveland.

**SHIP DESIGNERS.**

Kidd, Joseph ..... Duluth.  
 Kreer & Parsons ..... Chicago.  
 Rice & Lovejoy ..... Buffalo.  
 Steel, Nacey & Hynd ..... Cleveland.  
 Wood, W. J. .... Chicago.

**SHIP LANTERNS AND LAMPS.**

Russell & Watson ..... Buffalo.

**SHIPMATE RANGES.**

Stamford Foundry Co. .... Stamford, Conn.

**SHIP TIMBER.**

Martin-Barriss Co. .... Cleveland.

**SMOOTH-ON COMPOUND, FOR REPAIRS.**

Smooth-On Mfg. Co. .... Jersey City, N. J.

**STAYBOLT IRON OR STEEL BARS, HOLLOW OR SOLID.**

Falls Hollow Staybolt Co. .... Cuyahoga Falls, O.

**STEAM VESSELS FOR SALE.**

Gilchrist & Co., C. P. .... Cleveland.  
 Holmes, Samuel ..... New York.  
 Lester, S. S. .... Quebec, Can.  
 McCarthy, T. R. .... Montreal, Can.

**STEAMSHIP LINES, PASS. AND FREIGHT.**

American Line ..... New York.  
 Anchor Line ..... Buffalo.  
 Boston Steamship Co. .... Boston.  
 Cleveland & Buffalo Transit Co. .... Cleveland.  
 International Mercantile Marine Co. .... Philadelphia.  
 Mallory Line ..... New York.  
 Merchants' Montreal Line ..... Montreal.  
 New York & Cuba Mail S. S. Co. .... New York.  
 Red Star Line ..... New York.  
 United Fruit Co. .... Boston.

**STEEL CASTINGS.**

Otis Steel Co. .... Cleveland.  
 Sutton Co., C. E. .... Toledo, O.

**STEERING APPARATUS.**

American Ship Building Co. .... Cleveland.  
 Chase Machine Co. .... Cleveland.  
 Detroit Ship Building Co. .... Detroit.  
 Hyde Windlass Co. .... Bath, Me.  
 Marine Mfg. & Supply Co. .... New York.  
 Moulton Steering Engine Co. .... New York.  
 Sheriffs Mfg. Co. .... Milwaukee.

**SUBMARINE DIVING APPARATUS.**

Morse & Son, A. J. .... Boston.  
 Schrader's Son, Inc., A. .... New York.

**SURVEYORS, MARINE.**

Gaskin, Edward ..... Buffalo.  
 Hynd, Alexander ..... Cleveland.  
 Lovejoy, H. O. .... Buffalo.  
 Matteson & Drake ..... Philadelphia.  
 Parker Bros. Co., Ltd. .... Detroit.  
 Nacey, James ..... Cleveland.  
 Rice, Henry ..... Buffalo.  
 Steel, Adam ..... Cleveland.  
 Wood, W. J. .... Chicago.

**TESTS OF MATERIALS.**

Hunt, Robert W. & Co. .... Chicago.  
 Lunkenheimer Co. .... Cincinnati, O.

**TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.**

Watson-Stillman Co. .... New York.

**TOOLS, WOOD WORKING.**

Atlantic Works, Inc. .... Philadelphia.

**TOWING MACHINES.**

American Ship Windlass Co. .... Providence, R. I.  
 Chase Machine Co. .... Cleveland.

**TOWING COMPANIES.**

Donnelly Salvage & Wrecking Co. .... Kingston, Ont.  
 Great Lakes Towing Co. .... Cleveland.

**TRAPS, STEAM.**

Kieley & Mueller ..... New York.  
 Sturtevant Co., B. F. .... Hyde Park, Mass.

**TRUCKS.**

Boston & Lockport Block Co. .... Boston.

**TUBING, SEAMLESS.**

Shelby Steel Tube Co. .... Pittsburgh, Pa.

**VALVES, STEAM SPECIALTIES, ETC.**

Ashton Valve Co. .... Boston.  
 Crane Co. .... Chicago.  
 Jenkins Bros. .... New York.  
 Kieley & Mueller ..... New York.  
 Lunkenheimer Co. .... Cincinnati.  
 Ross Valve Co. .... Troy, N. Y.

**VALVES FOR WATER AND GAS.**

Lunkenheimer Co. .... Cincinnati.  
 Ross Valve Co. .... Troy, N. Y.

**VARNISHES.**

Detroit Varnish Co. .... Detroit.  
 Detroit White Lead Works ..... Detroit.  
 Also Ship Chandlers.

**VENTILATING APPARATUS FOR SHIPS.**

Sturtevant, R. F. Co. .... Hyde Park, Mass.  
 Sutton Co., C. E. .... Toledo, O.

**VESSEL AND FREIGHT AGENTS.**

Boland, John J. .... Buffalo.  
 Brown & Co. .... Buffalo.  
 Elphicke, C. W. & Co. .... Chicago.  
 Fleming & Co., E. J. .... Chicago.  
 Gilchrist & Co., C. P. .... Cleveland.  
 Hall, John B. .... Buffalo.  
 Helm & Co., D. T. .... Duluth.  
 Hawgood & Co., W. A. .... Cleveland.  
 Holmes, Samuel ..... New York.  
 Hutchinson & Co. .... Cleveland.  
 Lester, S. S. .... Quebec, Can.  
 McCarthy, T. R. .... Montreal.  
 Mitchell & Co. .... Cleveland.  
 Parker Bros. Co., Ltd. .... Detroit.  
 Prindiville & Co. .... Chicago.  
 Richardson, W. C. .... Cleveland.  
 Sullivan, D. & Co. .... Chicago.

**WATER GAUGES.**

Bonner Co., Wm. T. .... Boston.  
 Lunkenheimer Co. .... Cincinnati, O.

**WATERTIGHT BULKHEAD DOORS.**

"Long Arm" System Co. .... Cleveland.

**WHISTLES, STEAM.**

Ashton Valve Co. .... Boston.  
 Lunkenheimer Co. .... Cincinnati.

**WILFORD'S WATERPROOF CLOTH.**

Bunker, E. A. .... New York.

**WIRE ROPE AND WIRE ROPE FITTINGS.**

Baker, H. H. & Co. .... Buffalo.  
 DeGrauw, Aymar & Co. .... New York.  
 Upson-Walton Co. .... Cleveland.

**WINDLASSES.**

American Ship Windlass Co. .... Providence, R. I.  
 American Ship Building Co. .... Cleveland.  
 Hyde Windlass Co. .... Bath, Me.  
 Marine Mfg. & Supply Co. .... New York.

**WINCHES.**

American Ship Windlass Co. .... Providence, R. I.  
 Georgian Bay Engineering Works ..... Midland, Ont.  
 Hyde Windlass Co. .... Bath, Me.

**WOOD WORKING MACHINERY.**

Atlantic Works, Inc. .... Philadelphia.

**WRECKING AND SALVAGE COMPANIES.**

Donnelly Salvage & Wrecking Co. .... Kingston, Ont.  
 Great Lakes Towing Co. .... Cleveland.  
 Parker Bros. Co., Ltd. .... Detroit.

**YACHT AND BOAT BUILDERS.**

Drein, Thos. & Son ..... Wilmington, Del.  
 Georgian Bay Engineering Works ..... Midland, Ont.  
 Truscott Boat Mfg. Co. .... St. Joseph, Mich.

**YACHT BROKERS.**

Clapham & Clapham ..... New York.

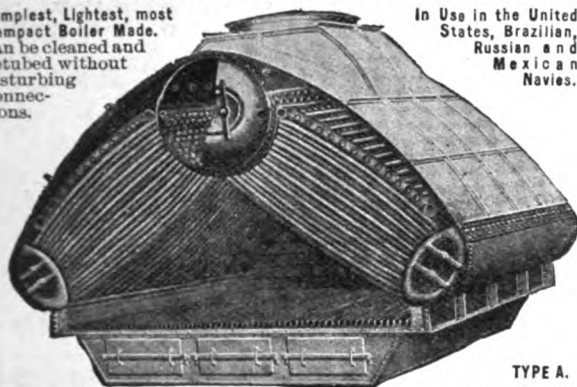
**YAWLS.**

Drein, Thos. & Son ..... Wilmington, Del.

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Simplest, Lightest, most Compact Boiler Made. can be cleaned and retubed without disturbing connections.

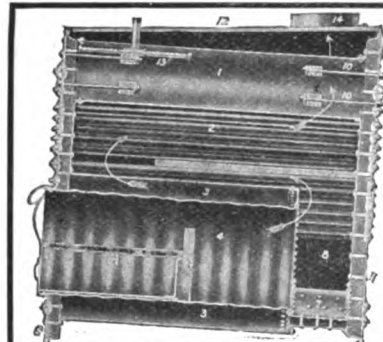
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Internally Fired.

Scotch and Water Tube types combined, eliminating all objections.

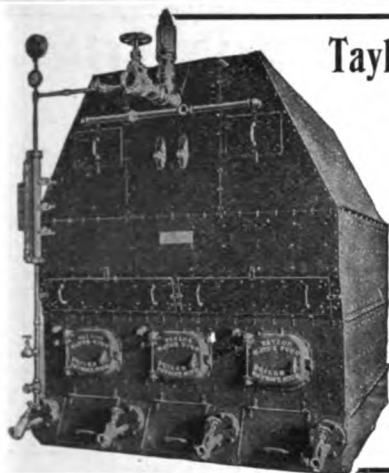
Half the weight of ordinary Scotch boilers.

Standard corrugated furnaces.

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Investigate before buying any other.

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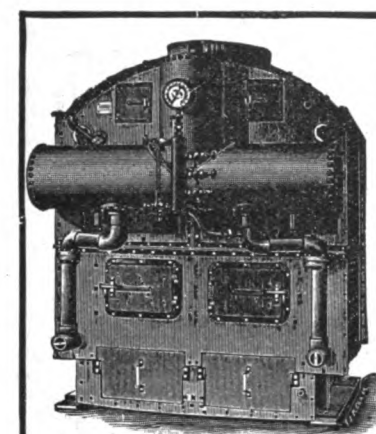


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Vertical Tubes, sectional, large steam space and liberating area. Fire box, combustion chamber, and course for the furnace gases similar to the Scotch Marine. Free circulation type.

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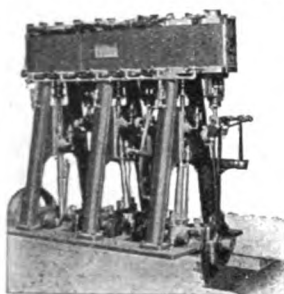
**Excellent Qualities**

**Almy Water-Tube Boiler Co.**

PROVIDENCE, R. I.

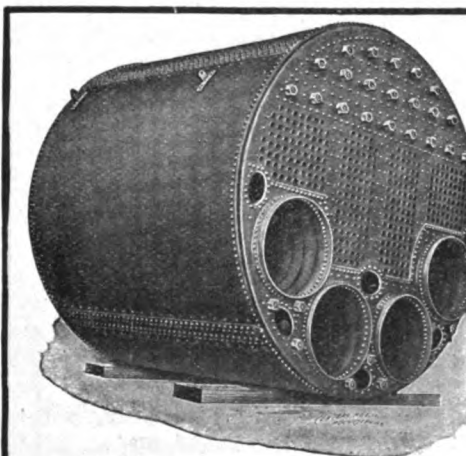
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Builders of Single, Compound, Triple - Expansion and Direct Connected Engines.

Boyer Sectional Water Tube boilers and Machinery complete for light draft Passenger Boats, Yachts, Tugs, Etc.



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OF ALL TYPES

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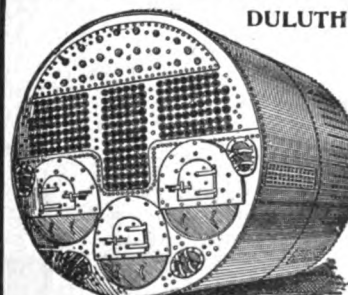
**The Upson-Walton Co.,**

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**Northwestern Steam Boiler & Mfg. Co.**

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OF THE FORMER COMPANIES:

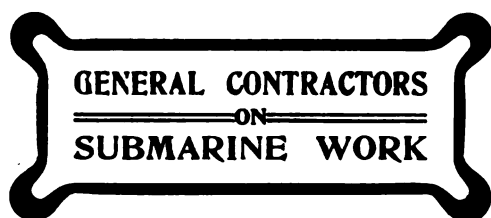
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Hauler & Lutz Co.  
Green's Dredging Co.  
Chicago Star Con. & D. Co.  
McMahon & Montgomery Co.  
Chicago Dredging & Dock Co.  
Griffith, McDermott & Watt  
Dredging Co.  
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Capacity, 1,000 tons.

Draft, 7½ ft. forward, 13½ ft. aft.

Length on keel blocks, 180 ft.; over all, 190 ft.

Machine Shop, Foundry and Steam Forge.

Dredges, Drill Boats and Derrick Scows.

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Will contract to remove ROCK or EARTH on the Great Lakes to 40 ft. depth.  
To remove ROCK on Atlantic Coast to 40 ft. depth.

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Tipperary Boy, Steel.	Protective Policy, 500 yds., Steel.
Erin Go Braugh.	Reciprocity, 600 yds., Steel.
<b>Drill Boats</b>	Cuba Libre, 250 yds., Steel.
Geo. A. Howells and	Gold Standard, 250 yds., Steel.
another, both Steel.	No. 5, 600
<b>Tugs</b>	No. 6, 600
Shaugbraun, Steel	No. 7, 600
Phil. Sheridan, Steel	No. 8, 600
Spalpeen, Steel	
Paddy Miles, Steel	4,000
Shaun Rhue, Steel	McMyler derrick handling 10 tons
<b>Derrick</b>	at 75 ft. radius.
Faugh a Ballaugh	Small Scows

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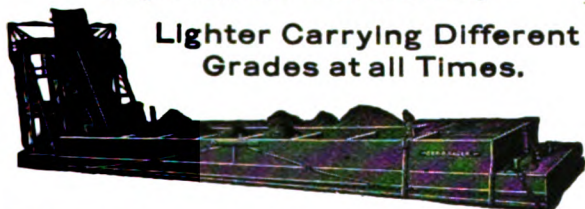
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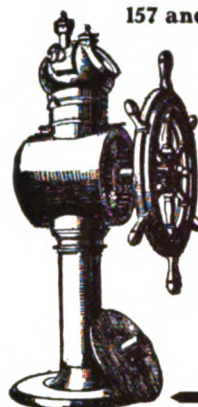
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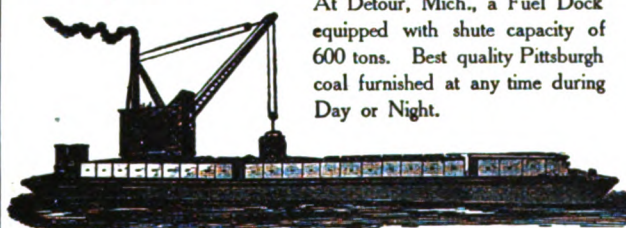
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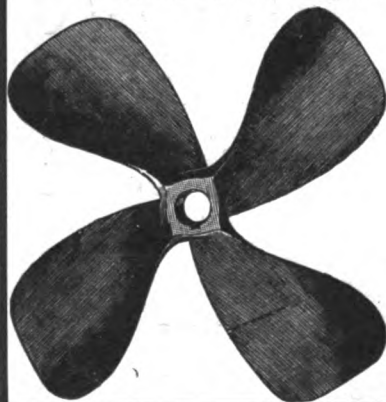
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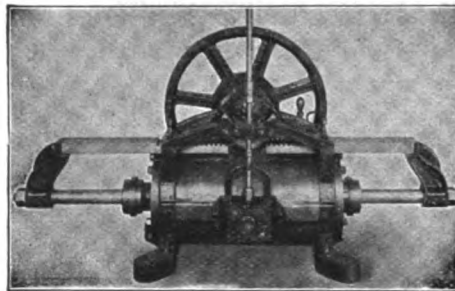
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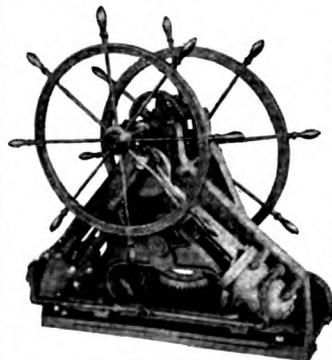
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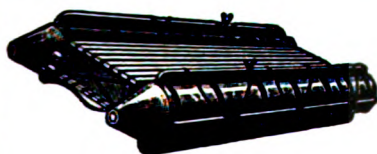
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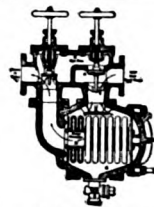
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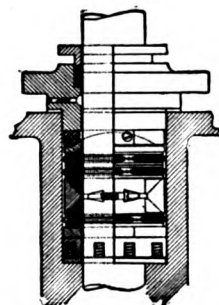
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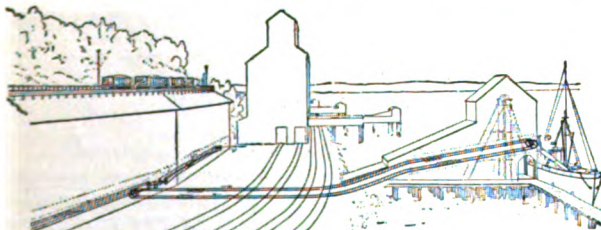
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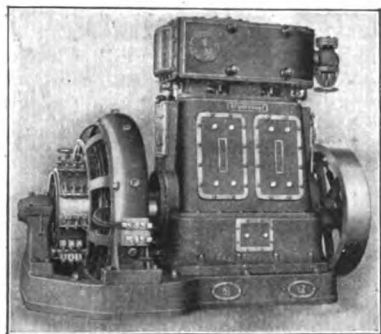
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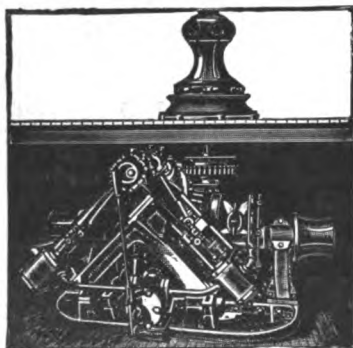
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